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AN ANALYSIS OF THE USE OF SOCIAL PROCESSES DURING COMPUTER USE

THESIS

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Abstract

This study investigated the claim that people use social processes relating to other humans when interacting with computers. A laboratory study ($n = 38$) manipulated two team factors, identity and interdependence, and a stereotype activation effect to two labels, *generalist* and *specialist*. Subjects for this study were military members or civilians working for the military. The results show that none of the subjects reported being influenced by team or stereotype manipulations as given in self-reports. Incongruent to these findings, the behavioral data demonstrated that subjects were influenced by stereotype labels. There were no interaction effects between team factors and stereotype labels found in either self-reported data or behavioral data.

AN ANALYSIS OF THE USE OF SOCIAL PROCESSES DURING COMPUTER INTERACTION

I. Introduction

Computers are rapidly becoming ubiquitous in our lives. Recently the New York Times reported that there are 33 personal computers for every 100 American workers (Nasar, 1994). It is not only personal computers which people must deal with but also the larger mainframes, the mini- or micro-computer, and computers hidden in other objects. We frequently have hidden computer interactions. Increasingly computers are hidden in other tools or playthings in order to make them responsive, fun, intelligent, easy to use and comfortable. The talking teddy bear, the microwave oven which self-monitors the power level and duration of cooking time required for the particular food, the gas pump that accepts your credit card for payment, and the self-cleaning litter box are but a few examples of hidden computer interactions.

Traditionally we have held that human-tool interaction should be rational and efficient. We have not believed that tool use is a social interaction between the person and the tool. Yet it can be argued that since computer systems are frequently designed to seem human-like and to display human-like attributes, basic social processes such as the development of group identities, the existence of politeness norms, and the

acknowledgment of "self" and "other" evaluations are activated in computer users during computer interaction. This leads people to display and use, to various degrees, human social processes while interacting with computer systems. Understanding the benefits and risks involved to human-computer interactions when people do not consciously make delineations between the created and the natural could lead to better technology design, utilization, and evaluation of the possible impacts of advanced technology on society (Kiesler, Waters, and Sproull 1996; Reeves and Nass 1996).

Problem Statement

We know little about what and which situational cues encourage people to use social norms during computer interaction. Knowledge about situational cues which activate the use of social processes during computer-human interaction could lead to better software design, better training programs, and increased user acceptance and utilization of computer systems. This study manipulates situational cues in order to activate the use of social norms during computer interaction. Two areas are explored. The first area was whether attributes of social processes influence computer users' self-reported attitudes towards the computer. The second area was whether the attributes of social processes influence computer users' behavior.

Research Objectives

The primary objective of this study is to examine whether simple manipulations can lead to the use of social processes during computer interaction and if computer users' self-reported attitudes and behaviors are influenced. An experiment to manipulate two

relevant factors of team dynamics, identity and interdependence (Nass, Fogg, and Moon, 1996), and a stereotype attitude activation effect to two labels (specialist and generalist) was accomplished. The experiment is a two (team member/non-team member) by two (generalist/specialist) between subject design. The experiment is designed to explore three research questions:

1. Will the team affiliation between computer-human lead to the same outcome as human-human team affiliation?

2. Do stereotype labels applied to computer functions affect computer user behavior?

3. Does team affiliation interact with stereotype labels to affect computer user behavior?

The hypothesis to test the three research questions are developed in Chapter III. It is expected to find that social processes can be manipulated with relative ease and that these processes do affect computer users' attitude towards the computer programs and their behavior while interacting with the computer.

II. Literature Review

Introduction

At first glance interactions with computers appear to be free of social pressures. But as computers become more sophisticated in their responses and are incorporated in unexpected objects, the interactions we have with computers become more complex and contain hidden influences. The purpose of this study is to better understand the nature of human-computer interactions and the hidden influences within these interactions. This chapter provides the background information required to understand the purpose of this study.

Therefore several questions were addressed. The first question was why do this research? The second question was what are mental models? The third question was what are the components of mental models? The fourth question was what effects do stereotypes have? The fifth question was what effects do team relationships have? And then finally, the chapter concludes with a summation of previous research completed in this area.

Why this Research?

Man is and historically has been a tool creator. Our tools fulfill numerous social, survival and personal desires and needs. Traditionally our tools have had superior physical characteristics but recently tools have migrated from the physical realm. No longer do tools only have superior physical abilities, they now mimic superior abstract

and cognitive abilities. These are characteristics and responses previously used to identify living organisms and humans in particular. This shift has strained the mental models we use when interacting with tools and when defining appropriate tool use behaviors.

Anthropomorphism, or applying human characteristics to non-human things, is the general term used when people act in a manner which appears to demonstrate a belief that some non-human thing possesses human characteristics, or when people apply human-human social norms and rules when interacting with a non-human things. When people react to computers as if the computer possesses human characteristics, they are generally viewed as demonstrating inappropriate behaviors (Horton and Wohl, 1956; Turkle, 1984; Zuboff, 1988; Reeves and Nass, 1996; Kiesler, Sproull, and Waters, 1996). Since the advent of computers and their spread in our lives, the traditional view of anthropomorphism as it relates to computers has been explained by two different concepts.

The oldest explanation is that the individual is deficient in some manner. The inappropriate behavior is explained as being caused by ignorance or psychological or social dysfunction (Horton and Wohl, 1956; Turkle, 1984; Zuboff, 1988). In this view, an individual who is not psychologically or socially dysfunctional will no longer respond to computers in a social manner once they are shown/taught how computers are made and/or operate. Researchers who put forth this explanation all agree that normal, healthy, well-informed individuals do not demonstrate anthropomorphic behaviors when operating human tools (Horton and Wohl, 1956; Turkle, 1984; Zuboff, 1988).

In contrast, the second traditional explanation of anthropomorphic behavior towards computers is that the individual is reacting in a rational manner and is responding to the fact that computers are tools which embody the characteristics of the human who created them. In this explanation individuals are believed to adopt the mental view that the computer is a proxy for the human designer or programmer. Therefore the individual is interacting with the human creator or programmer through a machine medium, the computer. Human-computer interactions are now human-human proxy interactions. The demonstration of anthropomorphic behavior when engaged in human-human proxy interaction is considered appropriate (Dennett, 1988; Nass, Steuer, Henriksen and Dryer, 1994). While this explanation justifies anthropomorphic behavior as it relates to human-computer interaction, the underlining assumption of this explanation is that adoption of the human proxy view is a conscious decision made by the individual. Again it is assumed that normal, healthy, well-informed individuals do not demonstrate anthropomorphic behaviors towards tools unless they are aware of doing so.

Both explanations hold the common thread that normal, healthy, well-informed individuals demonstrate behaviors consistent with their acknowledged beliefs. But research conducted in the social and cognitive psychology arenas suggest that individuals can be encouraged to act in a manner that is inconsistent with a stated mental belief (Nass and Steuer, 1993). Additionally, it can be very easy to influence an individual to behave in a manner not consistent with the mental belief that the individual acknowledges as being appropriate in a given situation (Nass and Steuer, 1993; Sproull, Subramani, Kiesler, Walker, and Waters, 1996; Reeves and Nass 1996; Lipari 1996.) In response to

this research a third explanation for anthropomorphic behavior during computer usage has been proffered. Social interaction with technology arises from the general psychological tendency of people to respond socially when they are in situations which remind them of their own humanity or social selves (Reeves and Nass, 1996; Kiesler et. al., 1996).

What are Mental Models?

Two leading researchers in mental models explain that mental models are modular in nature, idiosyncratic--not representative of reality but a representation of the individual's perception of reality, non-static in nature, and biased towards accepting inputs which confirm the model (Gilbert, 1991; Hinsz, 1995). Hinsz describes mental models as:

> A mental model is an individual's mental representation and belief about a system, and the individual's interaction with the system, with particular focus on how the individual's interactions with the system lead to outcome of interest. This definition indicates four elements that are central to the definition of a mental model: (a) the individual, (b) the system, (c) the interactions between the individual and the system, and (d) the outcomes of the individual's interaction with the system. These four elements play a central role in the different types of beliefs that are the foundation of an individual's mental models: (a) beliefs concerning the individual's action with regard to the system, (b) beliefs about the way that a systems works, and (c) beliefs about the relations of the individual's interaction with the system to important outcomes...(Hinsz, 1995; 202, 203)

Mental models lead people to broadly define a system as any independent group of items or any regular interaction which forms a unified whole. Examples of systems are the daily commute to work, brushing your teeth, art, Americans, IBM, a car, traffic,

calculators, and computers. Each make up a system and each system has its own attached mental models (Hinsz, 1995: 204).

These mental models are activated by generalizations and generalizations are activated by psychological filtering devices and cues. Some situational cues are more powerful than others and appear to more strongly inhibit the individual from discarding an inappropriate generalization and attached mental model (Gilbert, 1991; Anderson and Sedikides, 1991; Gilbert, Giesler, and Morris, 1995; Power, Murphy, and Coover, 1996). When a generalization is activated by one or more strong cues, individuals find it more difficult to discard than when the generalization is activated by weaker cues. To discard an initial generalization and governing mental model, one of the following need to occur. One, many cues which are in conflict with the generalization are acknowledged. Two, one or more strong cues which actives a different generalization and mental model are acknowledge. Three, the individual actively assesses the appropriateness of the generalization and attached mental model. If the generalization is found to be inappropriate then a searched for a more appropriate generalization is conducted. If found, the new generalization and mental model are adapted. If the individual is unable to find what they consider to be a more appropriate generalization, then the components of the generalization which are most in conflict are discarded or minimized. This has an attenuating effect on the attached mental model. If the minimized generalization is very weak or obviously ineffective given the situation, individuals start the process of forming a new generalization and mental model. In this process an old mental model, even when actively acknowledged as poor or inappropriate, is used to help the formation of a new

mental model (Wilson and Rutherford, 1989; Gilbert, Krull, and Malone, 1990; Anderson et. al., 1991; Bargh, Chaiken, Govender, and Pratto, 1992; Gilbert, Tafarodi, and Malone, 1993; Gilbert et. al., 1995; Hart, 1995; Chartrand and Bargh, 1996).

What are Components of Mental Models?

Components of mental models are scripts, norms, and schemata. The difference between and the importance of scripts, schemata and norms can be described by the following.

> ...a script is related to a sequence of actions for an event.... A schemata generally refers to a richly interconnected network of attributes related to a concept, person, category or group (stereotype). Schema generally do not denote the nature of the interactions with a system...a norm may state the types of responses that are expected under specific circumstances, but it is prescriptive in nature and do not describe how the response will lead to the outcome, nor does it necessarily reflect the individual's beliefs about the operation of a social system. (Hinsz, 1995:205)

Each of these influential components may have a powerful effect on how an individual behaves, what the individual believes, and which situational inputs are easily accepted or rejected.

What Effects do Stereotypes Have?

Stereotypes are one psychological schemata which are frequently active in mental models. Stereotypes have been central to the field of social psychology since the term was coined in 1922 (Sherman, 1996:1126). When stereotypes are activated they influence how individuals perceive situational inputs, what inputs they seek out when interacting with the stereotype group, and what situational inputs are easily accepted or ignored.

Stereotypes appear to be influenced by two types of knowledge, exemplar-based and abstract. Exemplar-based knowledge is knowledge based on examples of experiences with the stereotype group. Exemplar-based stereotypes appear to be most influential when an individual has had few interactions with the stereotype group. Abstract knowledge acts like a summary of the typical traits for the group. This type of knowledge takes longer to develop because abstract knowledge appears to depend on the existence of a level of exemplar-based knowledge before it is formed. Abstract knowledge is less likely to change directions (a positive view of the group or a negative view of the group) than exemplar-base knowledge (Sherman, 1996: 1126-1129). Stereotype labels provide access to the abstracted knowledge. The trait knowledge contained by the abstract stereotype filters what situational inputs are considered salient. There appears to be an implicit belief that negative/positive features associated with the stereotype are caused by an underlying factor associated with that group. This causal belief increases the resistance to contradictory information. This information, in turn, influences behaviors (Anderson and Sedikides, 1991; Powers et. al., 1996; Sherman, 1996).

According to the research conducted by Sternberg there are different traits which indicate intelligence, Two of these traits cut across the intelligence type boundaries: "problem solving" behaviors and "social competence" behaviors. These two traits capture between 22 and 39 percent of the factors which describe intelligence. A third important trait is "verbal ability" which captures 19 percent of the factors for general intelligence and 12 percent for academic intelligence. Verbal ability was not found to be

a common characteristic of everyday intelligence (Sternberg, Conway, Ketron, and Bernstein, 1981: 44, 45).

Some factors which make up the problem solving trait are: the ability to reason logically and well; the ability to identify connections among ideas; the ability to size up the situation well; the ability to make good decisions; and the ability to deal with the problem resourcefully. Some factors which make up the verbal ability trait are: verbal fluency, knowledge about a particular field, ability to converse well, and ability to read with high comprehension. The top three factors which describe social competence are: acceptance of others, ability to identify and willingness to admits mistakes, and display of interest in the world at large (Sternberg et.al., 1981:45).

Many of the factors which indicate intelligence, (ability to reasons logically and well, ability to makes good decisions, verbal fluency, and possession of knowledge about a particular field), are factors that computers appear to display while in operation. These apparent traits of intelligence could be sufficiently powerful to activate the social processes of a mental model since these traits are most often associated with human interactions. Stereotype labels which were formally applied only to humans and which contain these traits, such as "generalist" and "specialist" may be associated with the mental models that people currently use. If these stereotype labels are not currently used in reference to computers, they might be brought into the mental models with relative ease. This study attempted to influence the subject's computer mental model by applying the stereotype labels of SPECIALIST or GENERALIST to a computer function.

What Effects do Team Relationship Have?

Team membership can substantially affect behavior and attitude. Team members are more accepting of information if it is delivered by a fellow team member (Mackie, Worth, and Asuncion, 1990; Reeves and Nass, 1996). In one study, group polarization, the process of forming groups and arriving at group norms, beliefs, and behaviors, took the form of information acceptance. When subjects were presented with information, the source of which was identified as part of the subjects' group or part of an outside group, subjects were more accepting of the information from within their own group and found it to be of higher quality (Mackie et. al., 1990).

Another aspect of team membership is; team members are more likely to act cooperatively and move towards consensus. In one study, subjects were given a complex problem to solve. In solving the problem, all subjects were placed in a room together. Some subjects were given team designations while other subjects were not. The team subjects cooperated more to solve the problem and arrived at the solution faster than non-team subjects (Abrams, Wetherell, Cochrane, Hogg, and Turner, 1990).

Other aspects of team membership are that team members: 1) believe that fellow team members are similar to themselves; 2) feel a stronger requirement to agree with the team opinion; and 3) conform more to teammates behaviors and expressed attitudes (Nass et. al., 1996; Reeves and Nass, 1996).

With such team membership effects, formation of a computer partner as a team member could affect users' responses to the computer and attitude about the computer. This could encourage more computer utilization and may lower computer anxiety.

Previous Research

Nass, Reeves, Kiesler and Steuer are primary researchers exploring the situational cues that prime individuals to engage in social processes when interacting with computers. These researchers follow the same general methodology. The first step is to observe a human-human interaction and identify the social rules which are applied to the interaction. Next, they identify key components of the interaction and replace one human with a computer in the interaction. Third, using subjects who are familiar with computers, they run the human-computer interaction. And finally, they analyze the responses and/or behaviors from the human-computer interaction to see if the identified social processes and predicted outcomes occurred.

Laboratory experiments have demonstrated that people follow the social process of identifying between a psychological "self" and an "other". Nass and Steuer conducted an experiment that consisted of a simple manipulation of a computer praising and criticizing its own performance in two different voices. Even though the two voices came from the same computer, the experiment's subjects to applied the following social rules: 1) performance evaluations of others are more accurate than are performance evaluation of self; 2) praise from others is friendlier than praise from self; and 3) criticism from self is friendlier than criticism from others. All subjects in this experiment had completed at least one introductory course in computer programming. In spite of that experience the different voices from the same computer led the participants to respond to each separate voice as if it had distinct intentions. The voices encouraged participants to activate a mental grouping of ideas that is used to define "self" and "other." (Nass and Steuer,

1993). Even in the face of contradicting clues, (being explicitly told that the voice is a characteristic of a computer program and the subjects' personal knowledge that programs are a compilation of set responses to inputs), did not induce the participants to discard the mental model of an "other."

Researchers Nass' research group asked the question, how real are computer personalities? In this study psychological criteria for a real personality was used. Nass selected a personality factor from the Five-Factor Model, which commonly contains the following factors: (a) Extroversion (or dominance or submissiveness), (b) emotional stability (or neurotiscism), (c) agreeableness, (d) conscientiousness, and (e) culture (also known as intellect or openness to experience). The dominance factor was selected. For the study a computer was programmed with either a dominant or submissive personality. Dominance and submissiveness were operationalized by manipulating the phrasing of the text responses displayed by the computer, by changing the confidence level of the computer, and by changing the interaction order. The dominant computer used strong language in the form of assertions and commands, displayed an average confidence level of 8 on a 10 point scale and always went first when discussing each item with the experiment subject. The submissive computer used weaker language in the form of questions and suggestions, displayed an average confidence of 3 on a 10 point scale and always waited for the subject to initiate item discussion. Undergraduate students were subjects for the experiment. They were tested for dominance or submissive personalities prior to the experiment and either matched with a computer personality similar to or different from theirs. Subjects' responses to the computer personality followed the

personality research predictions for human-human interactions between personality types. The pattern of interactions between computer and human was the same as the pattern of interaction found in interpersonal interaction. This experiment demonstrated that computer personalities can be psychologically real to computer users. It also showed that the creation of computer personalities is not dependent on richly defined computer agents that possess natural language processing, sophisticated pictorial representations or artificial intelligence (Nass, Moon, Fogg, Reeves and Dryer, 1996; Moon and Nass, 1996).

Another experiment demonstrated that people are susceptible to flattery from computers and that the effects of computer flattery are the same as the effects of human flattery. In this experiment subjects, undergraduate students, received one of three possible feedback types from the computer: sincere praise, flattery (insincere praise), or a generic response. Compared to the generic response group, subjects who received flattery reported better performances, gave more positive evaluations of the interactions, and held a more positive regard for the computer. This occurred even though the subjects were told that the flattery responses given by the computer were not dependent on their actions. Subjects in this group also correctly indicated whether the praise from the computer was contingent on their work when completing the experiment's exit questionnaire. Subjects in the sincere praise groups responded similarly but not as strongly as the flattery group. These findings are consistent with the effects of flattery as described in social science literature (Fogg and Nass, 1997).

In a study to see if people would form team relationships with computers, it was found that team affiliation was dependent on whether or not people believe that they are interdependent with the computer. The effects of computer team membership were the same as human team memberships. These effects caused subjects to believe that the computer was more similar to them, be more open to influence by the computer, think that the information given by the computer was higher in quality, and find the computer interaction to be more pleasant (Nass et. al., 1996).

In a 1996 study, the effects of increased human-like characteristics displayed by computers were explored in a recent experiment to see if people could be induced to keep their word to a computer. Subjects played a prison dilemma game with either a person or a computer partner. The computer partner displayed various levels of human-like characteristics. There were three types of computer partners, a computer which only gave text base responses, a computer which responded in a human-sounding voice, and a computer which responded in a human-sounding voice and displayed a human face. Subjects most frequently kept their word when partnered with another human, and broke their word most often when partnered with the computer which displayed the greatest amount of human-like characteristics (the voice-face computer). Among the computer partnered subjects, subjects more frequently kept their word with the text-based computer than with either of the other two computer partners. Subjects kept their word with the human sounding voice computer more often than with the voice-face computer. Subjects also responded less positively towards the face-voice computer. However, subjects reported the highest level of partnership with the face/voice computer. The

feelings of partnership with face-voice computer was only slightly lower than those felt towards a human confederate. These findings suggest that numerous social processes may be activated by computers. In this case, intra-group downgrading may have occurred if the computer failed to meet the expectations that the subjects held concerning the quality of human characteristics displayed by the face-voice computer (Kiesler et. al., 1996).

III. Methodology

Introduction

This experiment was designed to manipulate team factors and stereotype factors. The two team factors manipulated, identity and interdependence, were used in a computer-human team situation. The stereotype factor was a labeling effect. Two labels, SPECIALIST and GENERALIST, were applied as the names of a computer program function. This labeling was accomplished to activate a stereotype attitude effect in the computer users.

The two factors of team dynamics explored in this study, identity and interdependence, have been shown by previous research to be strong situational factors for the formation and development of teams (Mackie and Cooper, 1984; Nass et. al., 1996). The manipulation of the team factors was one treatment group within the experiment. The second treatment within the experiment was the manipulation of stereotype attitude activation effect to two labels, specialist and generalist. Previous research has shown that stereotypes and situational factors which activate stereotypes appear to cause several information and behavior affects in individuals. These effects are: 1) what information does the individual notice and look for, 2) what situational cues does the individual notice and look for, 3) what information is readily accepted by the individual, 4) what attributes does the individual hold concerning the stereotype group or object, and 5) what is the individual's expectation of the interaction with the stereotype

group or objects (Miller, Baer, and Schonberg, 1979; Govender and Pratto, 1992; Hart, 1995; Gilbert et. al., 1995; Power et. al., 1996; Chartrand and Bargh, 1996).

A 2x2 design experiment was conducted. The experiment design factors were: team membership, non-team membership, specialist stereotype attitude activation, and generalist stereotype attitude activation. This experiment was designed to explore two concepts. One, can simple manipulations of team dynamics and stereotype activation labels lead people to use human social norms, scripts, schematas, and stereotype expectations during computer use. Two, do the use of human social norms, scripts, schematas, and stereotype expectations within the individual's mental model for computer interaction lead to the same outcomes as they do with human-human interactions. Three research questions were formulated to explore the two concepts. One, will the team affiliation between computer and human lead to the same outcome as human-human team affiliations? Two, do stereotype labels applied to computer functions affect computer user behavior? And finally three, does human-computer team affiliation interacts with stereotype labels to affect computer user behavior?

Hypotheses Development

Previous researchers, Nass, Reeves, Kiesler and others, have shown that computer users behave as though human social processes (social norms, scripts, schematas, stereotype expectations) are used and it appears that these social processes influence the users' behaviors (Nass and Steuer, 1993; Moon and Nass, 1996; Nass et. al., 1996; Kielser et. al., 1996; Reeves and Nass, 1996; Sproull et. al., 1996; Fogg and Nass, 1997).

Of the experiments previously conducted, one study accomplished in 1996 by Nass, Fogg, and Moon closely relates to this study. In the 1996 study, two team factors, identity and interdependence, were tested as they apply to human-computer teams. In this study the identity factor was operationalized by telling the subjects in the "team identity" treatment that they were part of the "blue team" and that they would interact with a teammate called the "blue computer." Subjects in the "non-team identity" treatment were told that they also would work with a computer, but that he or she would be a "blue individual" working on a "green computer." The interdependence factor was operationalized by telling the subjects in the "interdependence" treatment that they would receive the same evaluation as the computer that they interacted with, while the subjects in the "non-interdependence" treatment would told that they would be evaluated solely on only their own work (Nass et. al., 1996).

No human-computer study was found that dealt solely with stereotype expectation effects such as a label applied to a particular function of a computer program. Previous research efforts in the psychological-sociology fields have demonstrated that stereotype labels may have a profound effect on how an individual responds to the interaction with the stereotype object or group (Miller et. al., 1979; Govender and Pratto, 1992; Hart, 1995; Gilbert et. al., 1995; Power et. al., 1996; Chartrand and Bargh, 1996). Therefore, it is reasonable to assume that a stereotype label attached to a computer program function could affect the individual's expectations for that function and their behavior when using the computer program.

Six hypotheses were developed to test the three research questions. These six hypothesis were based on the social, psychological, and computer-human research which was reviewed for this effort and are listed below.

Hypotheses for Research Question One

The question asked if team affiliation between the computer and human will lead to the same outcomes as human-human team affiliation. Two hypotheses tested this question.

The first hypothesis is hypothesis 1a, stated: *team/non-team treatment does not affect computer user's assessment of the computer program given in self-reports.* This hypothesis was developed from the team research which predicts that team members find other team members to contribute relevant information, to contribute helpful information, to be similar to themselves, and to influence them (Nass et. al., 1996:73). This hypothesis is tested through the responses given to questions one, two, three and six from the Exit Questionnaire which is discussed later in this paper. A t-test of two samples assuming unequal variance was conducted to test this hypothesis. In order to reject this hypothesis, a p-value below .05 is required.

The second hypothesis, hypothesis 1b, stated: *team/non-team treatment does not affect computer user's behavior as measured by recorded behavior.* This hypothesis was tested through the data recorded in the computer program. As explained in the Introduction section of this chapter, the data collected from the computer was broken into two sets of data. One set, the eleven item set, collected the subjects computer ranking

scores for the eleven items that they selected. The second set, the seven item set, did the same for the first seven items ranked by the subjects.

Research indicates that team members are influenced by each other and will attempt to reach an agreement with other team members (Nass et. al., 1996:73). A comparison of the mean movement scores for the two groups, team and non-team was used to test this hypothesis. An explanation for how the movement was scored can be found in Experimental Problem section of this chapter. To compare the means of the movement score a t-test of two samples assuming unequal variance was accomplished each set of data. In order to reject the hypothesis for either sets of data the p-value must be lower than .05.

Hypothesis for Research Question Two

Research question two asked if stereotype labels attached to computer function affected the user's behavior. This questions was tested by two hypotheses. Hypothesis 2a stated that: *specialist or generalist treatment does not affect computer user's assessment of the computer as measured by self-reported attitudes*. Exit Questionnaire questions four and five are the data collection points for testing the hypothesis. A t-test of two samples assuming unequal variance was conducted on the data from questions four and five of the Exit Questionnaire to test this hypothesis. In order to reject this hypothesis, a p-value below the .05 level is required.

Hypothesis 2b stated: *specialist/generalist treatment does not affect computer user's behavior as measured by recorded behavior data.* The data collected from the

computer was broken into two sets of data as explained in the Experimental Problem section of this chapter. This hypothesis was tested by measuring the movement that specialist/generalist subjects had from initial item selection and rankings (pre-computer) to final item selection and ranking (post-computer). A t-test of two samples assuming unequal variance was accomplished for each set of behavioral data. In order to reject the hypothesis for either set of data, the p-value must be lower than .05. This test of movement towards the computer solution by the subjects is consistent with the stereotype activation effects predicted by previous research (Miller et. al., 1979; Govender and Pratto, 1992; Hart, 1995; Gilbert et. al., 1995; Power et. al., 1996; Chartrand and Bargh, 1996).

Hypotheses for Research Question Three

Research question three asked if team affiliation interacts with stereotype labels to affect user's behavior. Two hypotheses tested this question. The first one, hypothesis 3a, stated: *no interaction effect between team/non-team treatment and specialist/generalist treatment exists in self-reported data.* This hypothesis was tested through the responses given to all questions from the Exit Questionnaire. Two-way ANOVAs were used to test this hypothesis. Since none of the questions from the Exit Questionnaire addressed interaction effects between the two treatment groups, it is necessary to test each of the six question . Therefore separate two-way ANOVAs were accomplished for each question and the significance level on the interaction line was used to reject or fail to reject the

hypothesis for the individual questions. In order to reject this hypothesis for any of the questions, a significance level below .05 must be reported.

The second hypothesis, hypothesis 3b, was: *no interaction effect between team/non-team treatment and specialist/generalist treatment exist in recorded behavior data.* The data from the computer was broken into two sets. The reasons for this is explained in the Introduction section of this chapter. This hypothesis was tested through two-way ANOVAs. A two-way ANOVA was accomplished for each set of data. In order to reject the hypothesis for either sets of data the p-value must be lower than .05.

Experimental Problem

A fictitious survival situation was developed for this study (see Appendix A). The experimental problem was created specifically for this experiment. It was designed to be similar to the "Desert Survival Problem" (Lafferty and Eady, 1974). The problem's design goal was to create a situation where the subject's movement towards or away from the ideal solution (the solution given by the computer) could be measured. This was accomplished by: 1) placing subjects in a fictional survival situation, 2) making subjects select a limited number of items that they believed to be helpful in the survival situation, 3) designing the survival situation problem so that there was no single correct solution, and 4) designing the survival situation problem to encourage subject-computer interaction. To this end, subjects were told that they had applied for and been granted a permit to farm a distant Earth-like moon. As part of the problem subjects were given some standard survival items and a list of sixteen other items. From this list of sixteen

items, subjects were told to select and rank order eleven items that they believed were most important to survival on the moon. Subjects were also told that of the eleven items selected, only the first seven ranked items were guaranteed to travel with them to the moon. The remaining items may travel with them or separately. If items remaining items did travel separately, the items would arrive at the moon within a nine months period of time.

It was believed that the survival problem could be sufficiently unfamiliar to the subjects that all subjects, regardless of treatment, would have a high level of willingness to accept the computer's solution. To overcome this potential problem, the data was divided into two sets. One set was data responses for the first seven selected items, the other set was data responses for all eleven selected items. Since only the first seven items could travel with the subjects, these items were believed to be critical. By separating these critical items from the rest, a measure of treatment effectiveness and subject's dependence on the computer could be obtained. If subjects respond significantly differently on these items, then it could be concluded that the subjects felt that they possessed sufficient expertise in the area of concern to make decisions based on their own knowledge and therefore did not possess a high degree of dependence on the computer's solution. But if a high degree of dependence did exist in the subjects, it was believed that this dependence would override the treatments for the critical items. Therefore a second set data, responses to all eleven items was also used. The eleven item set contained both the seven critical items and four discretionary items. The introduction of the four discretionary items was believed to reduce any dependence that subjects may

have felt on the computer's solution because of the subjects lack of knowledge in the area of concern. Since the discretionary items were over a third of the total items, it was believed that four items were sufficient to induce in the subjects a willingness to be influenced by other factors than the given computer solution. This influencing by other factors than the given computer solution allowed for the effects of the treatments to be measured even when subjects had a level of dependence on the computer's solution. Therefore, the degree of influence that the SPECIALIST and GENERALIST functions had on the subjects could be measured.

Therefore if the stereotype labeling was effective in modifying the subject's behavior, and not overcome by dependency, there would be a significant difference between the subjects movement towards the computer solution based on treatments. Subjects who used the greatest amount of social processing during the computer interaction would show greater movement towards the computer solution than subjects who used a lower amount of social processing when interaction with the computer. This would be consistent with the reviewed psychology and sociology literature (Anderson and Sedikides, 1991; Powers et. al., 1996; Sherman, 1996; Gentner and Holyoak, 1997; Holyoak and Thagard, 1997; Gentner and Markman, 1997).

The two stereotypes labels were chosen for the assumed traits attached to them. Traits attached to a "specialist" were: a high degree of knowledge in the subject, a high degree of competency in the subjects, and a high degree of authority. The "generalist" label was believed to have the same associated traits but at a lower level than the specialist.

Computer Programs

The computer programs used in the specialist and generalist treatments were created solely for this study. The programs utilized a graphical user interface (GUI). (Appendix B contains screen samples of the programs.) Except for the information given by assistance function labeled SPECIALIST or GENERALIST, the programs were identical in appearance and function. To use the program, subjects manipulated a mouse, GUI buttons, and the keyboard. Subjects received instructions in the treatment program in two formats: a text paper (Appendix D) and a software tutorial program.

The tutorial program was designed by the same individual as the treatment programs. This program used the same GUI interface and followed the same design guidance. It guided the subjects through actions critical to successful completion of the treatment program. Subjects were shown how to: 1) rank items, 2) change the rankings for an item, 3) select an item, 4) activate the assistance function, 5) move forward and backward within the program and 6) input text information. The paper reference guide repeated most of the instructions given in the tutorial program.

Operationalized Treatment Manipulations

This study was a 2x2 between subject design broken into team/non-team, by specialist/generalist. The operationalization of the team identity factor was accomplished by assigning subjects as "Red Team Members." Red Team Members were given a red band to placed around their right wrist and told that they would interact with a partner called the "Red Computer." The identity factor for non-team member subjects was

operationalized by assigning subjects as "Blue Individuals." These subjects were given a blue band to place around their right wrist and told that they would interact with a computer also called the Red Computer.

The operationalization of the interdependence factor for team membership was accomplished by informing Red Team Member subjects that they would receive the same evaluation as their partner, the Red Computer. The interdependence factor was operationalized by informing Blue Individuals that they would be evaluated separately from the computer.

As further operationalization of the team factors, when subjects interacted with the experiment's computer treatment program they were required to tell the computer if they were a "Red Team Member" or "Blue Individual." These operationalizations were consistent with the literature reviewed and very similar to the 1996 experiment conducted by Nass, Fogg and Moon (Nass et. al., 1996)

The stereotype labeling effect was operationalized in two manners. One, through the use of the SPECIALIST or GENERALIST label to identify the assistance function of the experiment's computer treatment programs and secondly through the information (Appendix C) that the computer function gave to the user.

Two computer programs were used. Each program was designed to give assistance with the experiment's unique survival problem. Each program displayed buttons labels SPECIALIST or GENERALIST but only one button was operational in each program. Subjects were instructed that the SPECIALIST or GENERALIST would give them additional information that may assist them with solving the survival problem.

Subjects in the specialist treatment could only access the additional information through the SPECIALIST function. Subjects in the generalist treatment could only access the additional information through the GENERALIST function. Information given by the SPECIALIST function was greater in detail for some of the items than information give by the GENERALIST function. The operationalization of these treatments were consistent with the stereotype attitude activation effect literature that was reviewed (Miller et. al., 1979; Govender and Pratto, 1992; Hart, 1995; Gilbert et. al., 1995; Power et. al., 1996; Chartrand and Bargh, 1996).

Experiment's Exit Questionnaire

Exit questionnaires (Appendices E and F) were created for this study. Each questionnaire consisted of two parts. Part one consisted of two questions to determine subject's familiarity with computers. The second part was designed to measure the success or failure of the experiment's treatments. Per the indices used by Nass, Fogg and Moon, four questions dealt with the team treatment: computer was helpful, computer gave good information, computer influenced subject's selections, and the computer reasoned similarly to subject's reasoning (Nass et. al, 1996). Two questions dealt with stereotype attitude activation towards the labels SPECIALIST and GENERALIST as applicable to the computer's programs assistance function: computer was competent and computer was logical. The questionnaire used a five-point linear, numeric scale (Alreck and Settle, 1995:127,128,129). This scale was selected for several reasons: it is simple and it incorporates the concept of equality--number three being the equivalent to zero.

This scale coupled with the presumption that attitude scales are interval, allowed statistical analysis of the data derived from the questionnaire (Cooper and Emory, 1995:146). The scale was coded reverse from normal. The one value indicated a high degree of agreement with the statement while the five value indicated a high degree of disagreement with the statement.

Research Environment

The experiment was conducted in the subjects' work building. Two rooms were used by subjects in this study. One room was a classroom arranged with individual desks and chairs facing in one direction. The second room was a computer laboratory. In this room seventeen individual workstations, (computer, 15 inch monitor, keyboard and mouse) were arranged facing one direction. All workstations were surrounded by barriers to block the user's view of the adjacent workstations. Both rooms were used prior by some subjects during the completion of normal work tasks.

Sample and Procedures

Subjects were graduate students at the Air Force Institute of Technology School of Logistics and Acquisition. Subjects were recruited from the Research Methods courses and most received extra credit in that course for their participation. All subjects had over one year's experience with a Windows operating environment and experience with using a computer mouse.

As subjects arrived to the classroom they were given a sealed package. This package contained the following: a sharpened pencil, the experiment's survival problem,

an information sheet on the experiment (Appendix G), and a colored ribbon (red or blue) with a number written on it. The packages were arranged in a manner which allowed an even distribution of treatments. For example the first four packages would be as follows: the team/generalist treatment package, the team/specialist treatment package, the individual/generalist treatment package and finally the individual/specialist treatment package. The color band contained in the package was part of the team/non-team treatment and the number on the color band assigned computers which gave subjects the specialist or generalist treatment. These packages, along with being sealed, had written instructions which stated: "Do not open until instructed."

Following the arrival of all subjects the experiment started. The same written script was read to all subjects (Appendix H). This script was read by the same person each time the experiment was run.

The experiment was conducted in two parts. This separating of the experiment in two parts mimicked what occurred in the Nass, Fogg, and Moon experiment (Nass et. al., 1996). The first part was the classroom portion. In this portion subjects received an information sheet about the study, confirmed their voluntary participation, created a unique identification number, were introduced to the experiment's survival problem, and made their initial item selection and rankings. After their initial rankings, subjects were told that they had been assigned a computer via the number written on the colored band that they had been given. At this point the team factors treatments were given. Subjects with red bands were told that they were "Red Team Members" and that they were partnered with a team member called a "Red Computer" and that they would be evaluated

together with their partner the computer. Subjects with blue bands were told that they were "Blue Individuals" and that they would also work with a computer called the "Red Computer" but that they told that they would be evaluated separately from the computer. All subjects were instructed to put their band around their right wrist. Next the subjects moved to the computer laboratory.

When the subjects entered the computer room they were instructed to find the computer whose number corresponded with number on their wrist bands. After ensuring that each subject was at the correct computer, the subjects were ready to begin this portion of the experiment. The first interaction that the subjects had with the computer was the tutorial program. This program taught the subjects the basic skills necessary to complete the treatment program. Once the tutorial program had been completed by the subjects, the subjects were instructed on how to access the treatment programs. Subjects received the stereotype treatment through their interaction with the treatment program. Two stereotype computer treatment programs were used. In both programs the buttons labeled SPECIALIST and GENERALIST were displayed on the screen. For those subjects who were assigned the specialist treatment, only the SPECIALIST button was operational and only through the use of the SPECIALIST could subjects access additional information on the sixteen items. For subjects in the generalist treatment, only the GENERALIST button was operational and this was the only means that subjects had to access the additional information on the items. A written reference guide (Appendix C) to the treatment programs was also given to the subjects at the beginning of the computer use portion of the experiment.

At the beginning of the computer treatment program, before item information could be accessed by the subjects, the subjects had to input their identification number, what type of person they were (Red Team Member or Blue Individual), and the initial item ranking and selection that they accomplished in the classroom. The next screen showed a comparison of the subject's item selection and rankings and the computer's item selection and rankings. Unknown to the subjects both treatment programs gave the same item selection and ranking solution (in rank order: item A, E, O, L, P, D, C. I, F, H, and N). Once this had been accomplished, subjects could then interact with the SPECIALIST or the GENERALIST function. In total subjects spent twenty minutes interacting with the treatment program. At the end of that time, subjects had five minutes to make the final item selection and ranking via the computer program. Once final selections and rankings were completed, subjects completed an Exit Questionnaire (Appendix E and F) and were thanked for their participation.

Hypotheses Testing Procedures

The experiment provided two types of data, self-reported data via the Exit Questionnaire and behavioral data via computer capture data. Both sets of data were used in testing the six hypotheses. Data from the Exit Questionnaire were scored according to the given scale response, one through five. The scale was reversed from normal therefore a score of one indicated a high degree of agreement with the questions and a score of five indicated a high degree of disagreement with the questions.

It is necessary that a single value be given to each subject's movement towards the computer's solution. Without this single score, statistical analysis could not be done. Therefore, the scores that reflect the subject's movement towards the computer's solution were computed. These movement scores were computed using the following method. First, the solution provided by the computer (the same solution for all treatments) was the base line. Since no subjects had access to this solution until after they made the initial rankings, none could be previously affected by this solution. Therefore, the computer solution was considered to be the base, or the 100 percent correct solution. Subject's initial rankings were compared to this base and subject received one point for each item that they selected and that was also selected as part of the computer's solution This was the initial ranking score. This score reflected the subject's movement towards the 100 percent solution prior to experimental factors being applied. The same comparison was repeated for the subject's final item selection and rankings as compared to the computer's. This reflected the subject's movement towards the 100 percent solution after receiving the experiment's treatments. Then the initial ranking score was subtracted from the final ranking score to produce the single score used in analyzing the computer data. This score gave the subject's true movement towards the 100 percent solution and reflects the effects that the treatments had on the subject's behavior.

To test the degree to which the subjects depended on the computer, the computer data was divided into two sets as discussed in the "Experiment's Problem" section of this chapter. One set data was for the first seven items selected and the second set was for all

eleven items selected. Each set of data was scored using the methodology described in the previous paragraph.

Two hypotheses were tested to answer the first research question. To test the first hypothesis, hypothesis 1a: "team/non-team treatment does not affect computer user's assessment of the computer program as given in self reports," a two tail t-test of two samples assuming unequal variance was conducted. This test determine if there was any significance difference between team treatment and non-team treatment. Questions one, two, three, and six from the Exit Questionnaire were data collections points for this hypothesis. Results from each question were separately tested.

The second hypothesis for research question one, hypothesis 1b, was team/non-team treatment does not affect computer user's behavior as measured by recorded behavior data. This hypothesis was tested through an independent two sample two tail t-test for team subjects and non-team subjects. This test was selected because an unequal number of subjects per treatment group occurred and because each treatment group had a small number of subjects.

The second research question was also tested by two hypothesis. The first hypothesis, hypothesis 2a, stated: specialist or generalist treatment does not affect user's assessment of the computer as measured by self-reported attitudes. A two tail t-test of two samples assuming unequal variance was conducted. This test was selected to determine significance difference between specialist treatment and generalist treatment. Questions four and five from the Exit Questionnaire were data collection points for this

hypothesis. A two tail t-test of two samples assuming unequal variance was conducted on each question, four and five.

The second hypothesis, hypothesis 2b, for this question states: specialist or generalist treatment does not affect computer user's behavior as measured by recorded behavior data. This hypothesis is tested in the same manner as hypothesis 1a, by a two tail t-test of two samples assuming unequal variance.

The third and final research question also had two hypotheses to test it. The first hypothesis, hypothesis 3a, stated that: there is not interaction effect between team/non-team treatment and specialist/generalist treatment in computer user's self-reports. This hypothesis was tested through the responses given to all questions from the Exit Questionnaire. Two way ANOVAs were used to test this hypothesis. A separate two-way ANOVA was accomplished for each of the six questions.

The last hypothesis, hypothesis 3b states that: no interaction effect between team/non-team treatments and specialist/generalist treatment exists in data as recorded by recorded behavioral data. Two two-way ANOVAs were accomplished during the testing of this hypothesis. As explained earlier, the data test for this hypothesis was in two groups. A two-way ANOVA was accomplished for each group of data.

IV. Analysis

The experiment provide two types of data, self-reported data via the Exit Questionnaire and behavioral data via the computer captured data. Exit Questionnaire data depicted the self-responses given by the subjects concerning their opinion and attitude towards the computer program. The computer captured data collected the behavioral responses of the subjects. These two types of data were used to test the three research questions via hypothesis testing of the associated hypotheses. Forty-three subjects participated in the experiment. Of those forty-three, two subjects failed to complete the experiment and their results were omitted from all analyses.

Exit Questionnaire Analysis

The forty-one subjects who made up this study all responded affirmatively to the first two questions on the questionnaire. They all had at least one year of experiment using a computer mouse and a Windows environment. Of the forty-one subjects who completed both parts of the experiment, three subjects were omitted from the analysis of the Exit Questionnaire data. These subjects were omitted because they gave inconsistent responses. These subjects gave agreement responses to all questions, including the reverse coded questions. This lead to the belief that the subjects in question did not adequately read both the scale used by the questionnaire nor the questions themselves. On this basis they were excluded from the analysis. To observe the effect that removing the three subjects had, Table 1 shows the frequencies and percentages for the initial forty-one subjects and for the revised thirty-eight subject group. Table 2 depicts the mean and

standard deviation for each of the six Exit Questionnaires questions using the thirty-eight subject pool.

Table 1. Response Comparison

41 Subjects				**38 Subjects**			
	Response	**Frequency**	**Percent**		**Response**	**Frequency**	**Percent**
Q. 1: Helpfulness	1	18	43.90	**Q.1: Helpfulness**	1	18	47.40
	2	21	51.20		2	20	52.60
	4	1	2.40		4	-	-
	5	1	2.40		5	-	-
Q. 2: Good	1	17	41.50	**Q. 2: Good**	1	17	44.7
	2	17	41.50		2	17	44.7
	3	5	12.20		3	4	10.5
	5	2	4.90		5	-	-
Q. 3: Influence	1	19	46.30	**Q. 3: Influence**	1	18	47.40
	2	22	53.70		2	20	52.60
Q. 4: Competent	1	5	12.20	**Q. 4: Competent**	1	5	13.20
	2	26	63.40		2	26	68.40
	3	7	17.10		3	5	13.20
	4	1	2.40		4	-	-
	5	2	4.90		5	2	5.30
Q. 5: Logical	1	5	12.20	**Q. 5: Logical**	1	5	13.20
	2	20	48.80		2	19	50.00
	3	9	22.00		3	8	21.10
	4	6	14.60		4	6	15.80
	5	1	2.40		5	-	-
Q. 6: Similar	1	4	9.80	**Q. 6: Similar**	1	4	10.50
	2	13	31.70		2	13	34.20
	3	16	39.00		3	15	39.50
	4	5	12.20		4	4	10.50
	5	3	7.30		5	2	5.30

** The five point scale used to answer these question was reversed from normal. One indicated a high degree of support and five a low degree of support for the question.

Table 2. Mean and Standard Deviations

Descriptive Statistics

	Mean	Std. Deviation	N
Q1	1.5263	.5060	38
Q2	1.6579	.6689	38
Q3	1.5263	.5060	38
Q4	2.1579	.8551	38
Q5	2.3947	.9165	38
Q6	2.6579	.9939	38

* The five point scale used to answer these question was reversed from normal. One indicated a high degree of support and five indicated a low degree of support for the question. Therefore a lower mean score indicates a high level of agreement while a high mean score indicates a high level of disagreement to the question. See Appendices E and F for Exit Questionnaire questions.

Computer Data Analysis

Due to technical problems, computer data was only captured on twenty-eight subjects who completed the experiment. Some difficulties encountered when capturing this data were: an error occurred in the program and data could not be retrieved, subjects turned off the computer and data was lost, subjects failed to complete final item selection and rankings so no comparison occurred, and subjects appeared to have attempted to access the Internet during the experiment causing the program to crash.

The computer data is based on the information requested during the computer treatment program. Subjects were asked to rank, in order, the initial eleven items selected and after interacting with the computer were asked to complete a final selection and ranking of items. From the two selections and rankings a single score was derived (see Chapter III; Experimental Problem). The derived ranking scores indicated the movement

of the subjects towards or away from the computer solution which was considered to be the ideal solution. This score was divided into two groups. One group contained the first seven ranked items which were guaranteed to travel with the subjects. The second group contained all eleven ranked items.

Research Question One Analysis

The first research question was: will the team affiliation between computer and human lead to the same outcome as human-human team affiliations? Two hypothesis tested this question. Hypothesis 1a was: team/non-team treatment does not affect computer user's assessment of the computer program given in self-reports. To test this hypothesis responses from questions one, two, three and six of the Exit Questionnaire were analyzed. A two tail t-tests of two samples assuming unequal variance was conducted for each of the four questions. An alpha level of .05 was used for all test. Tables 3 - 6 report two-sample t-test assuming unequal variances for each of the four questions on the Exit Questionnaire by team treatment.

Table 3 gives the test results for question one. The p-value given by the "P(T<=t) two tail" line has a value of 0.3654. In order to reject the hypothesis the p-value would have to be the alpha level of .05. Since the p-value was greater than .05 hypothesis 1a was not rejected for this question.

The second question's analysis results are given in Table 4. Again the two-tail results are the one of interest. The p-value here is 0.8286. Again the p-value was greater than .05, the alpha level, and hypothesis 1a was not rejected for this question.

Table 5 shows the results for question three. The p-value was 0.3654, above the alpha level of .05. Hypothesis 1a was not rejected for this question.

Question six results are in Table 6. The p-value was 0.3885. Therefore hypothesis 1a was not rejected for this question since the p-value is greater than .05.

Table 3. Hypothesis 1a, Question One

t-Test: Two-Sample Assuming Unequal Variances		
	Non-team	*Team*
Mean	1.590909091	1.4375
Variance	0.253246753	0.2625
Observations	22	16
Hypothesized Mean Difference	0	
df	32	
t Stat	0.918148857	
P(T<=t) one-tail	0.182704934	
t Critical one-tail	1.693888407	
P(T<=t) two-tail	**0.365409869**	
t Critical two-tail	2.036931619	

Table 4. Hypothesis 1a, Question Two

t-Test: Two-Sample Assuming Unequal Variances		
	Non-team	*Team*
Mean	1.636363636	1.6875
Variance	0.337662338	0.629166667
Observations	22	16
Hypothesized Mean Difference	0	
df	26	
t Stat	-0.218700874	
P(T<=t) one-tail	0.414295359	
t Critical one-tail	1.705616341	
P(T<=t) two-tail	**0.828590717**	
t Critical two-tail	2.055530786	

Table 5. Hypothesis 1a, Question Three

t-Test: Two-Sample Assuming Unequal Variances		
	Non-team	*Team*
Mean	1.590909091	1.4375
Variance	0.253246753	0.2625
Observations	22	16
Hypothesized Mean Difference	0	
df	32	
t Stat	0.918148857	
P(T<=t) one-tail	0.182704934	
t Critical one-tail	1.693888407	
P(T<=t) two-tail	**0.365409869**	
t Critical two-tail	2.036931619	

Table 6. Hypothesis 1a, Question Six

t-Test: Two-Sample Assuming Unequal Variances		
	Non-team	*Team*
Mean	2.772727273	2.5
Variance	1.231601732	0.666666667
Observations	22	16
Hypothesized Mean Difference	0	
df	36	
t Stat	0.872761621	
P(T<=t) one-tail	0.194288662	
t Critical one-tail	1.688297289	
P(T<=t) two-tail	**0.388577325**	
t Critical two-tail	2.02809133	

The second hypothesis for this question was hypothesis 1b which stated: team/non-team treatment does not affect computer user's behavior as measured by recorded behavioral data. To test this hypothesis a two tail two-sample t-test assuming

unequal variance was conducted. The alpha level for this t-test was set at the .05 level. In order to reject the hypothesis the p-value from the test would need to be less than .05. Since behavior data collected by the computer is in two sets, (see Chapter III, Experimental Problem), the t-test was accomplished on both sets of data.

The results of the t-test done on the eleven item data set are reported in Table 7. The p-value is 0.7794. This is considerably larger than .05 and therefore hypothesis 1b could not be rejected for this set of data..

The results of the t-test for the seven item data set are in Table 8. The p-value was 0.9199. Again this value is greater than .05 and hypothesis 1b was not rejected for this set of data.

Table 7. Hypothesis 1b, Eleven Item Set

t-Test: Two-Sample Assuming Unequal Variances		
	Non-team	*Team*
Mean	2	2.214285714
Variance	3.538461538	4.489010989
Observations	14	14
Hypothesized Mean Difference	0	
df	26	
t Stat	-0.282987872	
P(T<=t) one-tail	0.38971352	
t Critical one-tail	1.705616341	
P(T<=t) two-tail	**0.779427039**	
t Critical two-tail	2.055530786	

Table 8. Hypothesis 1b, Seven Item Set

t-Test: Two-Sample Assuming Unequal Variances		
	Non-team	*Team*
Mean	2.357142857	2.285714286
Variance	3.785714286	3.142857143
Observations	14	14
Hypothesized Mean Difference	0	
df	26	
t Stat	0.101534617	
P(T<=t) one-tail	0.459952533	
t Critical one-tail	1.705616341	
P(T<=t) two-tail	**0.919905066**	
t Critical two-tail	2.055530786	

Research Question Two Analysis

The second research question asked if stereotype labels applied to computer functions affect computer user's behavior. This question was also tested by two hypothesis. Hypothesis 2a stated: specialist/generalist treatment does not affect computer user's assessment of the computer program as measured by self-reports. Questions four and five from the Exit Questionnaire were data collection points for this hypotheses and this data was analyzed. A t-test of two samples assuming unequal variance was conducted. This test was run for each question. In all tests an alpha level of .05 was used. In order to reject the hypothesis a p-value less than the alpha level would be needed. Table 9 and 10 reported the results of these test.

Question four results are in Table 9. The p-value was 0.1406. This is greater than the alpha level of .05 therefore hypothesis 2a was not rejected for this question.

Table 10 reported the results of the t-test for question five. The p-value is 0.6584. Again this value is to large to reject the hypothesis so hypothesis 2a was not rejected for this question.

Table 9. Hypothesis 2a, Question Four

t-Test: Two-Sample Assuming Unequal Variances		
	Generalist	*Specialist*
Mean	2.333333333	1.941176471
Variance	1.033333333	0.308823529
Observations	21	17
Hypothesized Mean Difference	0	
df	32	
t Stat	1.510840729	
P(T<=t) one-tail	0.070320966	
t Critical one-tail	1.693888407	
P(T<=t) two-tail	**0.140641933**	
t Critical two-tail	2.036931619	

Table 10. Hypothesis 2a, Question Five

t-Test: Two-Sample Assuming Unequal Variances		
	Generalist	*Specialist*
Mean	2.333333333	2.470588235
Variance	0.733333333	1.014705882
Observations	21	17
Hypothesized Mean Difference	0	
df	32	
t Stat	-0.446232442	
P(T<=t) one-tail	0.3292172	
t Critical one-tail	1.693888407	
P(T<=t) two-tail	**0.658434399**	
t Critical two-tail	2.036931619	

The second hypothesis for this question was hypothesis 2b. This hypothesis stated that: specialist/generalist treatment does not affect computer user's behavior as

measured by recorded behavior data. To test this hypothesis two-sample t-test assuming unequal variance was conducted. The alpha level for this t-test was set at the .05 level. In order to reject the hypothesis the p-value from the test would need to be less than .05. Since behavior data collected by the computer is in two sets, (see Chapter III, Experimental Problem), the t-test was accomplished on both sets of data. The results for the test done to confirm or reject hypothesis 2b can be found in Tables 11 and 12.

Table 11 show the results of the t-test for the eleven item group. The p-value was 0.0222 and was therefore below the alpha level of .05. Therefore hypothesis 2b was rejected for this set of data. The conclusion was drawn that stereotype treatments did influence subject's behavior.

The seven item group results are found in Table 12. The p-value was 0.0262. This value was below the alpha level and therefore hypothesis 2b was rejected for this set of data. The conclusion was drawn that stereotype treatments did influence subject's behavior.

Since hypothesis 2b was rejected for both sets of data, it can be concluded that stereotype labels influence behavior. This influence extends to both the critical decisions for this experiment (the first seven items selected) and for non-critical decision made in the course of this experiment (the total eleven items selected).

Table 11. Hypothesis 2b, Eleven Item Set

t-Test: Two-Sample Assuming Unequal Variances		
	Generalist	*Specialst*
Mean	1.375	3.083333333
Variance	3.05	3.537878788
Observations	16	12
Hypothesized Mean Difference	0	
df	23	
t Stat	-2.451890963	
P(T<=t) one-tail	0.01111178	
t Critical one-tail	1.713870006	
P(T<=t) two-tail	**0.02222356**	
t Critical two-tail	2.068654794	

Table 12. Hypothesis 2b, Seven Item Set

t-Test: Two-Sample Assuming Unequal Variances		
	Generalist	*Specialist*
Mean	1.6875	3.166666667
Variance	3.429166667	2.151515152
Observations	16	12
Hypothesized Mean Difference	0	
df	26	
t Stat	-2.3576581	
P(T<=t) one-tail	0.01309761	
t Critical one-tail	1.705616341	
P(T<=t) two-tail	**0.026195219**	
t Critical two-tail	2.055530786	

Research Question Three Analysis

The third research question asked if team affiliation interacts with stereotype attitude activation effects. Two hypotheses tested this question. Hypothesis 3a was: no interaction effect between team/non-team treatment and specialist/generalist treatment exists in self-reported data. This hypothesis was tested through the responses given to all

questions from the Exit Questionnaire. Two-way ANOVAs tested this question. Each of the six questions had individual two-way ANOVAs conducted on them.

Table 13 is the two-way ANOVA results for Question one. This question measured the level of the "help" attribute associated with other team members. The line labeled SPECGEN*TEAM is the area of interest on this table. With an alpha value of .05 the p-value or significance had to be lower than the .05 level in order to reject hypothesis 3a. The p-value was .352, therefore the hypothesis was not rejected for this question.

The two-way ANOVA results for the question two which measured the level of the "good" attribute associated with team members are found in Table 14. With an alpha value of .05 the p-value or significance had to be lower than the .05 level in order to reject hypothesis 3a. The p-value for the interaction between the two treatment groups (team/non-team and specialist/generalist) can be found on the interaction line labeled SPECGEN*TEAM under the label "sig." This value is .480, well above the alpha level. Therefore this hypothesis was not rejected.

Table 15 depicted the results of the two-way ANOVA done on question three. This question dealt with the "influence" attribute associated with team members. The ANOVA was also conducted at the .05 level and in order for the hypothesis to be rejected, the significance value must be below the .05 level. The line labeled SPECGEN*TEAM is the area of interest on this table. The p-value for this question was .345. Hypothesis 3a is therefore not rejected for this question.

Question four dealt with the attribute of "competence." This attribute is associated with the stereotype labels "specialist" and "generalist." Table 16 depicted the

results of the two-way ANOVA done for question four. This ANOVA was also conducted at the .05 alpha level . In order for the hypothesis to be rejected, the significance value must be below the .05 level. On the interaction line, "SPECGEN*TEAM," the significance value was .75. This level is above .05, therefore the hypothesis was not rejected for this question.

Table 17 reports the results of an ANOVA which was completed on question five. This question also measured an attribute of the stereotype label, the attribute of "logical." With an alpha level of .05, the significance level had to be lower than .05 in order to reject hypothesis 3a. The significance level for the interaction between the two treatment groups (team/non-team and specialist/generalist) can be found on the interaction line labeled SPECGEN*TEAM under the label "sig." This value was .342, well above the alpha level. Therefore this hypothesis was not rejected.

The final question from the questionnaire, question six, measured a team attribute, "similarity." The two-way ANOVA was also conducted at the .05 alpha level . In order for the hypothesis to be rejected, the significance level must be below the .05 level. On Table 18, the interaction line, "SPECGEN*TEAM" is the line of interest. The interaction significance value was .75. This level is above the .05, therefore hypothesis 3a was not rejected for this question.

Table 13. Hypothesis 3a, Question One

ANOVA[a,b]

			Unique Method				
			Sum of Squares	df	Mean Square	F	Sig.
Q1	Main Effects	(Combined)	.682	2	.341	1.336	.276
		SPECGEN	.432	1	.432	1.692	.202
		TEAM	.200	1	.200	.784	.382
	2-Way Interactions	SPECGEN * TEAM	.227	1	.227	.889	.352
	Model		.800	3	.267	1.045	.385
	Residual		8.674	34	.255		
	Total		9.474	37	.256		

a. Q1 by SPECGEN, TEAM

b. All effects entered simultaneously

Table 14. Hypothesis 3a, Question Two

ANOVA[a,b]

			Unique Method				
			Sum of Squares	df	Mean Square	F	Sig.
Q2	Main Effects	(Combined)	.451	2	.226	.481	.622
		SPECGEN	.415	1	.415	.884	.354
		TEAM	2.0E-02	1	2.0E-02	.042	.839
	2-Way Interactions	SPECGEN * TEAM	.239	1	.239	.510	.480
	Model		.601	3	.200	.427	.735
	Residual		15.952	34	.469		
	Total		16.553	37	.447		

a. Q2 by SPECGEN, TEAM

b. All effects entered simultaneously

Table 15. Hypothesis 3a, Question Three

ANOVA[a,b]

			Unique Method				
			Sum of Squares	df	Mean Square	F	Sig.
Q3	Main Effects	(Combined)	.887	2	.444	1.843	.174
		SPECGEN	.718	1	.718	2.984	.093
		TEAM	.118	1	.118	.491	.488
	2-Way Interactions	SPECGEN * TEAM	.221	1	.221	.917	.345
	Model		1.291	3	.430	1.788	.168
	Residual		8.183	34	.241		
	Total		9.474	37	.256		

a. Q3 by SPECGEN, TEAM

b. All effects entered simultaneously

Table 16. Hypothesis 3a, Question Four

ANOVA[a,b]

			Unique Method				
			Sum of Squares	df	Mean Square	F	Sig.
Q4	Main Effects	(Combined)	3.131	2	1.566	2.254	.120
		SPECGEN	1.047	1	1.047	1.508	.228
		TEAM	1.847	1	1.847	2.659	.112
	2-Way Interactions	SPECGEN * TEAM	7.2E-02	1	7.2E-02	.103	.750
	Model		3.433	3	1.144	1.647	.197
	Residual		23.620	34	.695		
	Total		27.053	37	.731		

a. Q4 by SPECGEN, TEAM

b. All effects entered simultaneously

Table 17. Hypothesis 3a, Question Five

ANOVA[a,b]

			Unique Method				
			Sum of Squares	df	Mean Square	F	Sig.
Q5	Main Effects	(Combined)	.844	2	.422	.487	.619
		SPECGEN	.376	1	.376	.434	.514
		TEAM	.532	1	.532	.615	.439
	2-Way Interactions	SPECGEN * TEAM	.806	1	.806	.930	.342
	Model		1.626	3	.542	.626	.603
	Residual		29.453	34	.866		
	Total		31.079	37	.840		

a. Q5 by SPECGEN, TEAM

b. All effects entered simultaneously

Table 18. Hypothesis 3a, Question Six

ANOVA[a,b]

			Unique Method				
			Sum of Squares	df	Mean Square	F	Sig.
Q6	Main Effects	(Combined)	5.945	2	2.973	3.310	.049
		SPECGEN	5.210	1	5.210	5.801	.022
		TEAM	1.067	1	1.067	1.188	.283
	2-Way Interactions	SPECGEN * TEAM	2.6E-04	1	2.6E-04	.000	.987
	Model		6.016	3	2.005	2.233	.102
	Residual		30.536	34	.898		
	Total		36.553	37	.988		

a. Q6 by SPECGEN, TEAM

b. All effects entered simultaneously

Hypothesis 3b stated that: no interaction effect between team/non-team treatment and specialist/generalist treatment exist in recorded behavioral data. As explained in Chapter 3, Experimental Problem, computer data was divided into two groups. A two-

way ANOVA was conducted on the eleven item data set and also on the seven item data set. An alpha level of .05 was used for both two-way ANOVAs. Table 19 noted the results of the ANOVA done on the eleven item data set. As with the other ANOVA tables, the line of concern was the SPEC/GEN*TEAM line. The results were not significant at the alpha equal .05 level since the significance level was .729. Therefore the conclusion was not reject the hypothesis for this data set. The results of the two-way ANOVA conducted on the seven item data set was recorded in Table 20. On the SPEC/GEN*TEAM line, the significance was .737, above the .05 level needed to reject this hypothesis. Therefore this hypothesis was not rejected.

Table 19. Hypothesis 3b, Eleven Item Data Set

ANOVA[a,b]

			Unique Method				
			Sum of Squares	df	Mean Square	F	Sig.
SCORE	Main Effects	(Combined)	20.440	2	10.220	2.923	.073
		SPEC/GEN	20.012	1	20.012	5.723	.025
		TEAM/IND	.429	1	.429	.123	.729
	2-Way Interactions	SPEC/GEN * TEAM/IND	.429	1	.429	.123	.729
	Model		20.762	3	6.921	1.979	.144
	Residual		83.917	24	3.497		
	Total		104.679	27	3.877		

a. SCORE by SPEC/GEN, TEAM/IND

b. All effects entered simultaneously

Table 20. Hypothesis 3b, Seven Item Data Set

ANOVA[a,b]

			Unique Method				
			Sum of Squares	df	Mean Square	F	Sig.
SCORE	Main Effects	(Combined)	15.077	2	7.539	2.422	.110
		SPEC/GEN	15.003	1	15.003	4.820	.038
		TEAM/IND	7.4E-02	1	7.4E-02	.024	.878
	2-Way Interactions	SPEC/GEN * TEAM/IND	.360	1	.360	.116	.737
	Model		15.399	3	5.133	1.649	.205
	Residual		74.708	24	3.113		
	Total		90.107	27	3.337		

a. SCORE by SPEC/GEN, TEAM/IND

b. All effects entered simultaneously

Additional Analysis

In addition to hypothesis testing, several Cronbach's alphas were run on the Exit Questionnaire. The test completed on the whole questionnaire, all six questions, gave an alpha level of .6187 and a standardized alpha of .6741. The alpha test run on questions believed to identify team attributes, (one, two, three, and six), resulted in an alpha of .6101 and a standardized item alpha of .6986. Next a Cronbach's alpha was run on the questions believed to measure stereotype attributes, questions four and five. The results from this gave an alpha of -.0988 and a standardized item alpha of -.0991. These values indicate that question four and five did not measure the same factor. Consequently, hypotheses testing was done on each relevant question separately.

V. Conclusion

Introduction

The primary objective of this study was to explore two concepts. One, can simple manipulations of team dynamics and stereotype activation labels lead people to use human social norms, scripts, and schematas in their mental models while interacting with a computer. And secondly, can simple manipulations lead to the use of social processes during computer interaction and do these processes affect the user's judgment of the computer program. The three research questions below were formulated to explore the concepts.

Research Question 1. *Will the team affiliation between computer-human lead to the same outcome as human-human team affiliation?*

Research Question 2. *Does computer-human team affiliation have a positive effect on user assessment of the computer program?*

Research Question 3. *Does team affiliation interact with stereotype labels to affect user's behavior?*

Each of these questions and their attached hypothesis is examined. Next a discussion on the study's limitations is conducted followed by a summary of the study. Finally, suggestions for future research are made.

Research Question 1

This question asked if computer-human team affiliation leads to the same outcomes as human-human team affiliation. Four hypothesis tested this question. Those hypotheses are:

***Hypothesis 1a**: team/non-team treatment does not affect computer user's assessment of the computer program given in self-reports.*

As illustrated in Tables 3-6, this hypothesis was supported, therefore a failure to reject this hypothesis occurred. By failing to reject the hypothesis, the conclusion that team treatment has no effect on computer user's assessments of the computer program as given through self-reports of attitude data could not be rejected. This finding was consistent with the findings of Nass, Fogg and Moon 1996 study (Nass et. al., 1996).

Nass, Fogg and Moon had concluded from their study that interdependence was the key variable required to induce people to form teams with computers. Based on this conclusion, the current study linked the interdependence factor to the identity factor during team treatment. The results of this study do not clearly support the posits that interdependence is the key team factor which induces team formation with computers. However, extreme caution should be used if the results of this study are the basis of an argument that Nass, Fogg and Moon's assumption concerning the value of the interdependence attribute in team formation could be wrong. There are several factors of why this study may not be adequate in supporting or rejecting the theory of the importance of the independence attribute in team formation.

This study was based on a small sample size (38 subjects) and a reliability test accomplished on the survey instrument (Exit Questionnaire) indicates that the instrument did not perform as expected in this study. Additionally, the study's environment may have negated the strength of the team treatments. Subjects were tested in their work location and in rooms that they used on a regular basis. Also subjects were all associated with the military. Military members and associated civilians work in an environment in which many team situational cues are received daily. Uniforms identifying wearers as team members and work environment philosophy could be two factors which negated the team manipulations done in this study. It could be that subjects held a mental model in which team relations to accomplish any given task were already assumed and therefore subjects would give self-reports which indicated a formation of a team with the computer regardless of the study's manipulations of team factors. If so, the manipulations to encourage team formation would be useless and manipulations to discourage team formation would have been required for this environment and these subjects. That was not accomplished in this study.

Hypothesis 1b: *team/non-team treatment does not affect computer user's behavior as measured by recorded behavior data.*

The results of the test done for this hypothesis is that it may not be rejected. The data used to test this hypothesis was in two groups. As seen in Tables 13 and 14, it made no difference if subjects received the team or non-team treatment to their movement towards the computer's solution. There could be several reasons for these results and further research is required to say what caused the results found in this study. Three

reasons for why the results could have occurred are as follows. First, these results could indicate that the team treatments, which appeared to be adequate and verified by previous research, are not sufficient when applied to the formation of teams with computers. Or secondly, the environment and subjects used for this study could contain some unique environmental factor which negated the team treatments. (No studies could be found where subjects were military and/or civilians working for the military.) Because subjects were associated with the military, a team oriented population, and the experiment was conducted in the work building. Subjects could have brought with them strong mental models which incorporating the ready formation of teams to the experiment. Since there were no strong manipulations to discourage team formation, <u>all</u> subjects formed teams with the computer. A third possible reason could be that the problem the subjects were asked to solve was so unfamiliar to them that all subjects ignored team clues in favor of other situational cues.

Research Question 2

This question asked if stereotype labels attached to a computer function affected the user's behavior. This questions was tested by two hypotheses.

Hypothesis 2a: *specialist/generalist treatment does not affect computer user's assessment of the computer as measured by self-reported attitude data.*

As illustrated in Tables 9 and 10, this hypothesis could not be rejected. By failing to reject the hypothesis, the conclusion that stereotype treatment had no effect on computer user's assessments of the computer program was assumed. This was not the

expected finding. Sociology and psychology literature indicates that stereotype labels do have an effect on people's assessment of the stereotype object or group. There are several possible reasons for this finding. One, the treatments themselves were not sufficiently different to generate a different reported assessment of the computer program by the subjects. Two, the labels chosen, may not be stereotype labels when attached to a computer function. Three, the instrument used to measure self-report stereotype labels effects did not in fact measure this factor.

Hypothesis 2b: *specialist/generalist treatment does not affect computer user's behavior as measured by recorded behavioral data.*

As discussed earlier (Chapter III, Experimental Problem) the data used to test this hypothesis was in two groups. As seen in Tables 11 and 12, the significance level (p-value) was less than the alpha level of .05 and this hypothesis was rejected for both sets of data. It was therefore concluded for this data set that stereotype labels did influence subjects behavior.

Since the hypothesis was rejected in both sets of data used to measure subject's behavior, it can be concluded that while subjects may not report being influenced by stereotype labels, their behavior indicates that they are influenced by stereotype attitude activation effects. This finding is an important indication that self-reported behavior by computer users may not accurately reflect their actual behavior. This lack of convergence between actual behavior and self-reported behavior could be a serious problem for software designers who rely strongly on self-reports given by users to improve software programs. It also has implications for those people who train others in the uses of

computer programs. People who explore user acceptance and use of computer systems should also note these findings. They suggest a possible reason why computer users may accept a computer system and use a system but improved performance is not achieved.

Research Question 3

This question asked if team affiliation interacts with stereotype labels to affect user's behavior. Two hypotheses were used to test this question.

Hypothesis 3a: *no interaction effect between team/non-team and specialist/generalist treatments exist in self-reported data..*

To test this data, each of the questions from the Exit Questionnaire was used. Two-way ANOVAs were run independently on each of the six questions. The results of these ANOVAs are given in Tables 13 - 18. The line of interest in all the tables is the interaction line labeled SPECGEN*TEAM. In order to reject this hypothesis for any of the tables a significance level below the .05 level was needed. The significance level for these question ranged from a low of .342 for question five to a high of .987 for question six. Therefore the hypothesis could not be rejected for any of the questions. The conclusion reached was the there was no interaction effect between the two treatment groups for self-reported data.

Hypothesis 3b: *no interaction effect between team/non-team treatment and specialist/generalist treatment exist in recorded behavioral data.*

As illustrated in Table 19 and Table 20 this hypothesis could not be rejected. Tables 14 and 15 depict the results of the two-way ANOVAs which were accomplished

on both sets of behavior data. The line of interest is the interaction line labeled SPEC/GEN*TEAM on both tables. In order to reject this hypothesis, a significance level of less than .05 would be required. As seen the significance level for the first seven item data set was .729 and .737 for the eleven item data set.

In summation, hypotheses 1a, 2a, and 3a used self-reported data, responses to the questions on the Exit Questionnaire, for testing data. This data is attitudinal data. The null hypothesis was not rejected for any of the three hypotheses. It was concluded from this that the two treatment groups (team/non-team and specialist/generalist) did affect subjects responses to the Exit Questionnaire. Subjects did not report having been influenced by any of the treatments when assessing the computer program.

The testing of hypothesis 1b, 2b, and 3b used recorded behavioral data. This data was divided into two sets. The behavioral data was divided into these two sets because it was theorized that the experiment's problem could have been sufficiently unfamiliar to the subjects as to increase the subjects dependence on the computer's suggestion to the point that treatments were overcome for items that the subjects felt were critical. One set, the seven item set, was considered to have identified the most critical items from the subjects point of view. It was this set of data that was believed to be most affected by theorized dependency subjects may have felt. While the second set, the eleven item set, which had four discretionary items in it, was believed to be a second measure for treatment effects. It was believed that this set would be less affected by any dependency the subjects had to the computer's solution. The results of this study indicate that there was no behavior difference. If the null hypothesis could not be rejected for one set of

behavior data it also was not rejected when using the other set of behavior data. The same happened if the null hypothesis could be rejected. It was rejected by both sets of data. From these findings it was tentatively concluded that only one measure for behavioral data is required.

The results of the test done to reject or not to reject hypotheses 1b, 2b, and 3b for the seven item set of data are as follows. The null hypothesis was not rejected for hypothesis 1b. Both treatments, team and non-team, reported the same amount of movement towards the computer's solution. For the eleven item data set the mean for the team treatment subjects was 2.50 while the non-team subject's mean was 2.77. A close mean between the treatment was also found when using the seven item data set. Team mean was 2.35 and non-team mean was 2.28. These findings could have been due to the fact that the experimental problem was so unfamiliar to the subjects that all the subjects had a high willingness to adopt the computer's solution.

The test results for hypothesis 2b indicated a movement difference between the treatments, specialist and generalist. P-values below the .05 level were recorded and the null hypothesis was rejected. It was concluded that treatment did affect user's behavior. When testing the interaction effect between the two treatment groups, hypothesis 3b, data supporting the rejection of the null hypothesis was not found. Therefore the hypothesis was rejected and it was concluded that the two treatment groups did not interact.

The testing of hypothesis 1b, 2b, and 3b was also conducted on a second set of behavior data. This set was for all eleven items. Since four of the eleven items were discretionary items to the subjects, the strength of the treatment effects could be indicated

by the amount of movement the subjects made towards the computer's solution. The null hypothesis was rejected for hypothesis 2b, but not for hypothesis 1b and 3b. Therefore it was concluded that only the stereotype labels affected subject's behavior.

From the results of the test performed on both set of data, it was concluded that hypothesis 1b and 3b could not be rejected in total since both sets of data did not indicate grounds to reject the null hypothesis. The null hypothesis could be rejected totally for 2b since both sets of data produced results that rejected the assumption that stereotype labels do not influence behavior when interacting with a computer.

Limitations

This study suffered from several limitations. Two limitations were the small sample size and the performance of the survey instrument. With an *n* of 38 subjects for the self-reported data, (Exit Questionnaire responses), and an *n* of 28 subjects for the behavioral data, (data captured by the computer program), caution must be used when drawing inferences from this study. Repeats of this study with a larger subjects pool should really be done before any inferences are made.

The second large limitation was the performance of the survey instrument. This item did not performed as expected. This deviation from expected performance could be the reason why hypotheses 1a, 2a, and 3a were not rejected even thorough hypothesis 2b was rejected. Demonstrating that the stereotype labels did in fact influence the subjects' behavior. A second reason for the instrument's poor performance could be the small

sample sized used. Again, further testing with a larger subject pool should be accomplished before the instrument is rejected as faulty.

An additionally, this study suffers from the same limitations as all other laboratory based research efforts. The results were obtained from the subjects not in a natural environment. In the work, home, or play environments, countless cues which activate social processes exist. These cue are either received and accepted or rejected, or the cues are unacknowledged by the individual. As discussed in Chapter II, what cues are used in social processes, how those processes influence mental models, and how the mental models influence behavior is complex. Influential factors in the laboratory may be lost, weakened, or ignored in the general confusion of the work, home, and play environments. Therefore, factors of influence in a laboratory setting need to be tested in a more natural setting before conclusions are drawn. There is little practical value in knowing that factor X causes people to respond in a given manner at the laboratory if factor X does not cause people to respond in the same manner outside of the laboratory.

Conclusion

This study furthers the research that has been done and is currently being done to identify social factors that may influence people's behavior when interacting with a computer. Based on the results obtained, no strong conclusion can be made on whether or not the team attributes of identity and interdependence influence people to form a team relationship with a computer. Subjects in this study did not respond differently based on team manipulation. Since these two attributes do influence team formation

between humans, this lack of different response by the subjects to the team treatments may indicate that human-computer team formation is easily developed in environments where team formation is strongly encouraged and often used to accomplish tasks.

A second null hypothesis was also not rejected based on behavioral data. It was tentatively concluded that team and stereotype attitude activation effects do no interact with each other during computer use.

It can be tentatively concluded that stereotype labels applied to computer functions do influence computer users' behavior. This fact may be significant as computer further infiltrate our lives. It should also be noted that computer users do not report that they are influenced by stereotype labels describing a computer function when in fact the behavioral data supported the conclusion that the stereotype labels influenced behavior. Software designers should particularly note this finding.

When designing software, any self-reports by computer users or self-made assumption on the designer's part concerning behavioral influences while interacting with computers should be confirmed by behavioral data. Additionally, the users should not be aware that behavior data was captured during the computer interaction. If aware, users may alter their behavior from normal during computer interaction. Understanding and being able to manipulate factors that unconsciously influence behavior during computer use appears to be an area of study which has the potential for great returns.

Future Research

Testing the laboratory findings in the field is vital if the potential benefits and risks involved in human-computer interaction is to be understood and either maximized or eliminated. The understanding of the unconscious situational cues which influence computer users behavior should be explored in addition to the understanding of what situational cues computer users report as influencing their behavior. It is probably the unconscious influences on our behavior that affects our interactions with computer more than the conscious influences. People can accept, adapt, modify, and ignore influences that they are conscious of. But people have no ability, except through chance, to change situational influences that they are unaware of. It is the influences we are unaware of which most limit us.

Since the normal computer use environment contains numerous cues which influence several social process at any given time, researchers should explore a combination of social processes and their interaction during computer use. In this spirit three possible combinations are: 1) dominance/submissiviness (as psychologically defined) with stereotype labels, 2) politeness norms with upholding commitments to the computer, and finally 3) "self" and "other" evaluations with computers in three treatment groups, text base response, voice-based response and silent human animation response.

Summary

The infusion of computers into our lives gives ever increasing importance to understanding how we react to computers, what influences our behaviors when using

computers, and how to designing computer systems which do not adversely affect our behavior with computers. These tools are made increasingly responsive, intelligent, easy to use, and comfortable. They are also hidden in unexpected objects. To the computer user, these new tools appear to exhibit attributes and characteristics that we had formally identified with humans or other living objects. These increased attributes and characteristics appear to lead people to use human social processes when interacting with the computer. Therefore it is important to understand what conscious and unconscious social processes we engage in when using and evaluating computers.

Appendix A: Experiment's Survival Problem

SCENARIO

Identification number:

______ ______ ______ ______

Please do not turn the page until instructed.

Space Farming Problem

Scenario:

It is the year 2180. In the last 50 years great advances have been made in colonization of space. You have applied to the United Space Exploration and Colonization Agency (USECA) for a farming and colonization permit. This permit has been granted for moon JB-416. JB-416 is one of 6 moons which orbit planet B-1, a large gaseous planet. JB-416's gravitation and radiation levels are similar to Earth's. JB-416 has strong winds year round. Seasonal temperatures are moon-wide and similar to those found in the northern plain states of the USA. Additionally, the soil of JB-416 is lacking some essential elements for strong growth by Earth base plants. JB-416 has very limited surface water but has a huge planet-wide underground reserve of water located 10-200 feet below the surface. It is covered with plant growth and has a single genus of insects. The insects have voracious appetites and are solely responsible for limiting plant growth on JB-416. USECA has not approved any commercial insecticides for use on the moon. Since the native plant growth evolved without competition from mammals, the photosynthesis process conducted by the plants releases significantly lower amounts of oxygen than earth plants do. Therefore, JB-416 has a lower atmospheric oxygen level than Earth.

Your permit authorizes your family to farm 100 metric zelons on the moon JB-416. As part of your permit you will be given some items. All items have an operational life of 10 years or more. You will receive the following items from USECA:

1) Modular shelter materials sufficient to provide family housing and build one additional structure not to exceed 99 sq. ft.

2) One underground water pump with power source sufficient to provide water requirements for your family plus 20% more.

3) Wind fences (6 feet high) sufficient to protect 20 metric zelons.

4) One solar tractor with its solar battery and 4 soil preparation implements.

5) Hand held tools (shovels, axes, picks, rakes, scythe, hammer, nails, etc.)

6) Food goods in sufficient quantity to sustain your family for 15 months.

Because JB-416 is located 12 light years distance from the Earth you will only be authorized one free space cargo shipment. In this shipment, you may take 11 items with you. But due to limited space in the cargo bay, USECA only guarantees that your first seven items will travel with you. If space is limited, items ranked eight through eleven will arrive separately but not later than 9 months after you. Additionally, because JB-416 has just been open for colonization USECA's prime concern is the establishment of a suitable flora base that will raise the atmospheric level of oxygen. Therefore, no animals other than fowls 20 pounds or less are authorized for shipping. You will be unable to purchase additional items not brought with you to JB-416 for two years.

Please turn to next page.

USECA has provided you with the following list of items that you may choose from when making your eleven selections. All plant and animal choices have been certified to be viable with proper support on JB-416.

Selection List

Item	Item Description	Item	Item Description
A	Parasitic Wasp, 5 lbs (will kill the native insects)	I	Bumble bees, 3 colonies (will kill the native insects)
B	75 metric zelon of irrigation pipes	J	10ft by 30ft solar collector and eight Manicis solar batteries
C	100 lbs wheat seeds	K	80 lbs Hemp seeds
D	50 lbs of microorganism culture	L	One underground water pump with energy source
E	One gaggle of assorted geese (4 males and 16 females)	M	Two chicken sets (one egg laying set and one meat set, each set contains 15 females and two males)
F	100 tree seedlings (assorted fruit and hardwood trees)	N	50 lbs of corn seed and 50 lbs of rice seed
G	30 lbs assorted flower seeds	O	JB-416 USECA survey reports
H	80 lbs of assorted grasses and bamboo	P	50 lbs of assorted vegetable seeds

Please turn to next page.

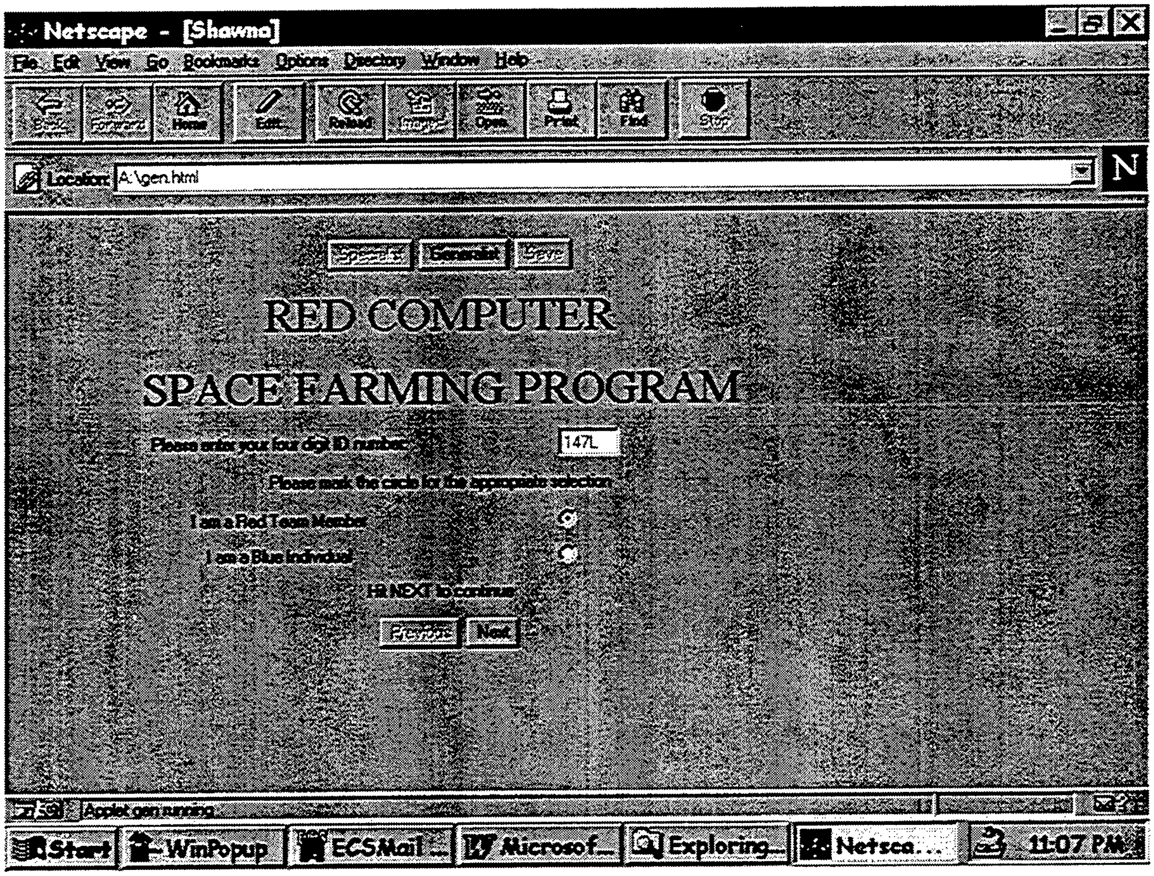
From the list on the previous page please select the eleven items you choose to take with you to JB-416. Your first choice should be ranked 1 and your last choice ranked 11.

Ranking	Item	Item Description
	A	Parasitic Wasp, 5 lbs
	B	75 metric zelons of irrigation pipes
	C	100 lbs. Wheat seeds
	D	50 lbs. Microorganism culture
	E	One gaggle of assorted geese
	F	100 tree seedlings
	G	30 lbs. Assorted flower seeds
	H	80 lbs. Assorted grasses and bamboo
	I	Bumble bees, 3 colonies
	J	10ft by 30 ft solar collector and batteries
	K	80 lbs. Hemp seeds
	L	One underground water pump w/energy source
	M	Two chicken sets
	N	50 lbs. corn seed and 50 lbs. rice seed
	O	JB-416 USECA survey reports
	P	50 lbs. Assorted vegetable seeds

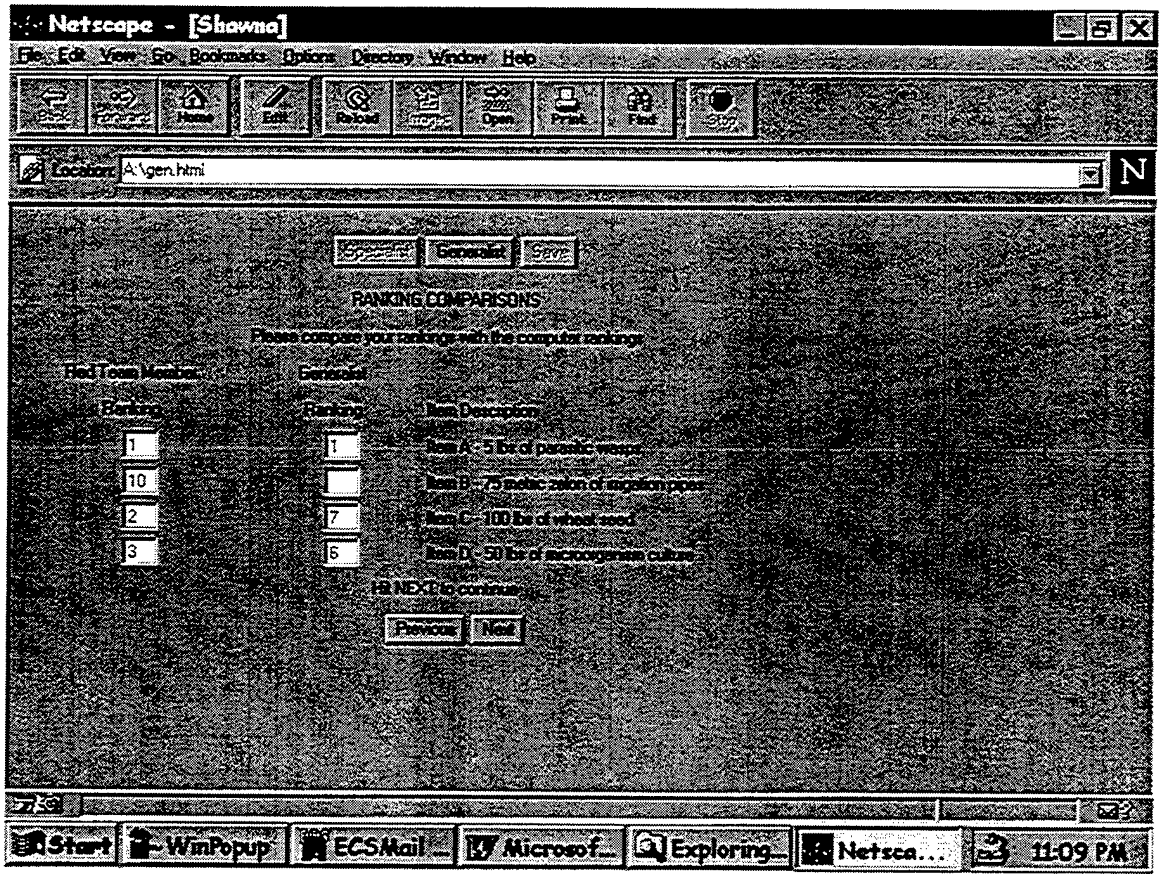
Once you have completed your rankings please wait for further instructions.

Appendix B: Screen Samples from Computer Program

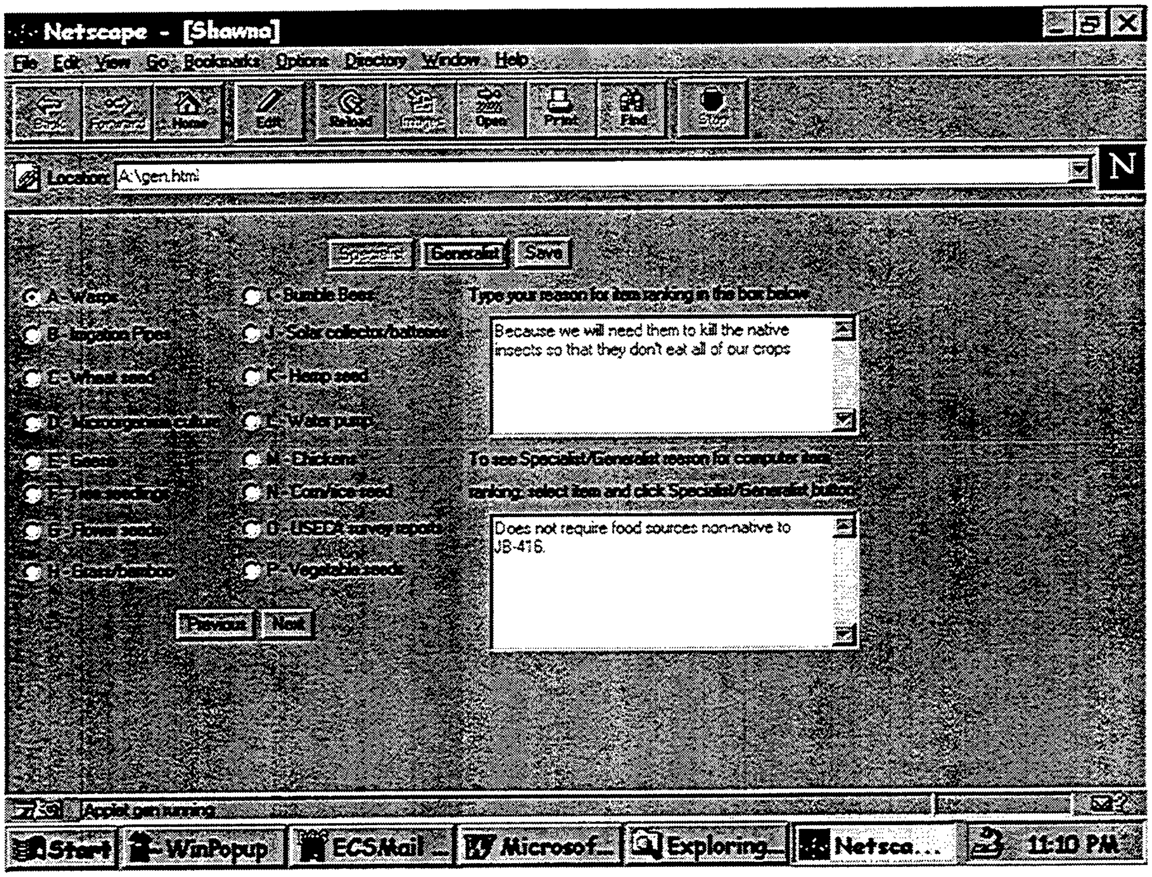
Initial Screen For Treatment Program



Sample Screen for Comparisons Between Computer Selection and Subject Selection



Sample Interactive Screen



Appendix C: Reference Guide to Computer Treatment Program

Fast Reference Guide

Buttons:

Next Click on this button to move to forward to the next screen.

Previous Click on this button to return to the last screen.

Save This button is used to save the inputs that you enter into the computer. When exchanging reasons for item selection with the computer, this button must be used to save your inputs and to clear the text field.

SPECIALIST

GENERALIST

These buttons are used to activate the assistance functions of the program. Select an item and then click on the button to assess the function.

These buttons are used to enter rankings or text and to indicate selected items. When used for rankings, old rankings must first be selected and removed before new rankings are entered. When used as a text field, old text must either be saved or selected and removed before entering new text. When used to indicate selection of an item, just click on the circle.

Procedures

Selecting an Item: To select an item move the mouse pointer to the item and click on the item.

To Activate a Button: To move the mouse pointer to the button and click on the button.

To Access the SPECIALIST/GENERALIST: First select an item. Once item is selected move mouse to appropriate button and click on the button.

To Save Text Inputs: To save your reasons for selecting an item or for giving an it a particular ranking, click on the SAVE button before selecting the next item.

Appendix D: Specialist and Generalist Responses

Item	Description	Generalist	Specialist
A	5 lbs of parasitic Wasps	Does not require food sources non-native to JB-416	Will double population every three months during Spring and Summer. Does not require food sources non-native to JB-416
B	75 metric zelon of irrigation pipes	Is not useful unless a water pump is attached	With proper ditches dug, irrigation pipes are not required to provide water to vegetables, wheat, corn, rice, or trees.
C	100 lbs of wheat seed	Is pollinated by the wind. Source of flour for baking.	Requires little additional irrigation and can withstand the winds. If needed, field can be flooded in the Summer to provide required irrigation. Is pollinated by the wind.
D	50 Lbs of microorganism culture	Is lacking in the soil of JB-416	Must be contained in the soil before planting earth plants.
E	gaggle of geese	Droppings contain microorganisms required by Earth seeds. Can forage for native food 9 months of the year	Droppings contain microorganisms required by Earth seeds. Can forage for native food 9 months of the year. If managed well, will produce 30 eggs and 5 goslings per female goose annually
F	100 Tree seedlings	Requires wind protection when young	Bumble bees are required for pollination. Needs wind protection in order to set and grow fruit. Provides wind protection when trees are older.
G	30 lbs of assorted flower seeds	Mainly valued for appearance and as a required food source for bumble bees.	Does not provide any essential component to the successful farming of JB-416. Mainly valued for appearance and as a required food source for bumble bees.
H	80 lbs of assorted grasses and bamboo	Will withstand the winds. Bamboo has multiple uses.	Will withstand the winds. Bamboo can be used in building construction, fences, and other uses. Some grasses are very pretty and would satisfy the desire for aesthetically pleasing landscaping

Item	Description	Generalist	Specialist
I	3 colonies of bumble bees	Are not effective predators of the native insects. Require pollen for survival.	Are not effective predators of the native insects. Require additional food source (pollen). Valued for the honey they produce.
J	10X30 ft solar collector/8 manicis batteries	All solar equipment brought to JB 416 has its own power source and batteries.	These items would not be used during the initial settlement of JB-416
K	80 lbs of hemp seed	Primarily provides materials only used for clothing and carriers.	This item does not provide food or sturdy construction materials. The primary concern during initial settlement is adequate food source.
L	1 underground water pump w/solar energy source	Needed to provide the additional water requirements to all Earth plants/seeds	This item is required to provide the additional water necessary for all Earth plants/seeds.
M	2 chicken sets	Are not effective foragers of native plants	Are not effective foragers of native plants and animals. Would require supplemental food from colonists' food sources during Fall and Winter.
N	50 lbs of corn seed and 50 lbs of rice seed	A wind-pollinated food source	Both plants are wind pollinated and will withstand the winds. Both can be used in multitude of recipes.
O	JB-416 USECA survey reports	Only available in-depth information about planet	Successful farming is dependent on understanding the land you are farming. Additionally the cultivation of native species may be more profitable than the cultivation of Earth species.
P	50 lbs of assorted vegetable seeds	If the geese or chickens are kept 6 weeks in the planting area before planting required microorganisms will be in the soil. Plants can be hand pollinated.	Dried food goods will not be emotionally satisfying after a short period of time. If the geese or chickens are kept six weeks in the planting area before planting, the required microorganisms will be in the soil. Plants can be hand pollinated.

Appendix E: Exit Questionnaire for Generalist Treatment

Participant Information:

Please write the unique identification number that you created at the beginning of this experiment on the line provided: ________________

Please respond to the following questions by placing an X in the space provided in front of the most appropriate response.

1) Do you have at least one year experience in operating a computer mouse?

_______ Yes _______ No

2) Do you have at least one year experience in using a windows environment during computer usage?

_______ Yes _______ No

PLEASE TURN TO NEXT PAGE

You will now be asked a series of questions concerning the experiment you just completed. Please use the below scale for all your responses.

			Scale			
Extremely Agree	**1**	**2**	**3**	**4**	**5**	**Extremely Disagree**

*If you extremely agree with the question pick a number from the far left of the scale and jot it in the space provided below the question. If you extremely disagree with the question pick a number from the far right of the scale, and if your answer is between the extremes pick a number from someplace in the middle of scale to show your opinion. (**Only use** the numbers provided on the scale. **Please do not** use a number not on the scale.)*

1) I felt that the information provided by the GENERALIST was helpful in my decision making process.

____

2) I did not feel that the GENERALIST gave good information concerning the items.

____

3) Information received from the GENERALIST did not influence my final ranking of items.

____

4) I think that the GENERALIST was competent.

____

5) I felt that the rankings that the GENERALIST gave the items were logical.

____

6) I did not think that the selection reasons that the GENERALIST gave were similar to my reasons.

____

Appendix F: Exit Questionnaire for Specialist

Participant Information:

Please write the unique identification number that you created at the beginning of this experiment on the line provided: ________________

Please respond to the following questions by placing an X in the space provided in front of the most appropriate response.

1) Do you have at least one year experience in operating a computer mouse?

_______ Yes _______ No

2) Do you have at least one year experience in using a windows environment during computer usage?

_______ Yes _______ No

PLEASE TURN TO NEXT PAGE

You will now be asked a series of questions concerning the experiment you just completed. Please use the below scale for all your responses.

			Scale			
Extremely Agree	**1**	**2**	**3**	**4**	**5**	**Extremely Disagree**

If you extremely agree with the question pick a number from the far left of the scale and put it in the space provided below the question. If you extremely disagree with the question pick a number from the far right of the scale, and if your answer is between the extremes pick a number from someplace in the middle of scale to show your opinion. ***(Only use*** *the numbers provided on the scale.* ***Please do not*** *use a number not on the scale.)*

1) I felt that the information provided by the SPECIALIST was helpful in my decision making process.

____

2) I did not feel that the SPECIALIST gave good information concerning the items.

____

3) Information received from the SPECIALIST did not influence my final ranking of items.

____

4) I think that the SPECIALIST was competent.

____

5) I felt that the rankings that the SPECIALIST gave the items were logical.

____

6) I did not think that the selection reasons that the SPECIALIST gave were similar to my reasons.

____

Appendix G: Subject's Information Sheet

INFORMATION
ABOUT THIS RESEARCH STUDY

Thank you for agreeing to participate in this research project. Your voluntary participation can make an important contribution to the goals of this research project.

Description of the study: This study will explore computer utilization in problem solving.

How your participation will be used: Your participation and the information you provide will be utilized in a thesis effort by an Information Resource Management student.

Confidentiality of your response: This information is being collected for research purposes only. No socially identifiable labels such as proper names or national/state/DOD identification numbers will be used in this project. At the beginning of the experiment you will be asked to provide a unique four letter/numeric identification number. That identification number will then be used throughout the research project.

PRIVACY ACT STATEMENT

In accordance with AFR 12-35, Paragraph 8, the following information is provided as required by the Privacy Act of 1974.

Authority: 10 U.S.C. 8012, Secretary of the Air Force; powers and duties; delegation by; implemented by AFR 30-23, Air Force Personnel Survey Program.

Purpose: To obtain information on computer utilization.

Routine Use: To increase the understanding of computer usage. Data will be grouped prior to analysis. No analysis of individual responses will be conducted and only members of the research team and the team advisors will be permitted access to the raw data. Reports summarizing findings may be published.

Participation: Participation is VOLUNTARY.

Appendix H: Script

Script

Ladies and gentlemen, thank you for coming today and volunteering you time. (Please arrange yourselves so that one empty desk is between you and your neighbor.) I am Capt Shawna Wimpy and I will be conducting this experiment. If you were unaware that you would be a subject in an experiment today and do not wish to participate I ask that you please leave at this time. By choosing to remain I will assume that you are voluntarily electing to participate in this experiment.

As participants in this experiment I ask that you not discuss this experiment or any of your experiences with anyone until after Thanksgiving Day, November 27th. When you entered this room you should have been handed a large envelope with a number on the front and the words: "Please do not open until instructed" on the back. Does everyone have one of these envelopes?

Please open the envelope and remove the contents. You should have four items. If you do not have any other the following items please tell me: a second large envelope labeled "Scenario," a sheet of paper titled "Information about this research study," a sharpened pencil, and a color ribbon. Do each of you have these items?

Please turn to the paper titled "Information About This Research Study." We will go over the paper at this time. (READ PAPER) If you did not understand this paper please tell me so at this time.

In a few minutes the experiment will start. As stated in the information paper, this experiment is part of a thesis effort. It will be conducted in two parts, a classroom potion and a computer assistance portion. The first part will consist of the class room portion. During this portion you will do the following:

1) create a unique four digit alpha/numeric identification number
2) read the scenario and make initial rankings
3) be assigned a computer

This portion will last approximately 15 minutes.

During the second half of the experiment you will use prototype computer program. The program has been developed to assist you with the scenario covered in the classroom portion. In the computer portion of the experiment you will do the following:

1) run the tutorial for the prototype program

2) run the prototype program
3) make final rankings
4) complete exit survey

This portion of the experiment will last approximately 30 minutes.

We will now start the classroom portion of the experiment. Please open the envelope labeled "Scenario" and takeout the packet of papers. Please locate the words "Identification number" with four lines below. At this time create a unique four digit alpha/numeric identification number. Each unique identification number should contain at least 1 letter and 1 number digit. Place only one letter or one number digit on each of the lines provided. You will refer back to this identification number during the second part of the experiment. Once you have completed this please wait for further instructions.

If you have not completed the creation of the unique alpha/numeric identification number at this time please let me know at this time.

When I tell you to start flip the "scenario" page over and start the problem. You will have 15 minutes to read through the scenario and make your initial rankings. I will let you know when you have 5 minutes left and when you have 2 minutes left so that you can judge your progress. It is important that you have completed your initial rankings before the time expires.

You may start now. *Time:* ________________

Time: ________ **You have 5 minutes left.**

Time: ________ **You have 2 minutes left.**

Time is completed. Please stop work at this time.

You will now be assigned a computer. Please pick-up the color ribbon. On the ribbon is written a number . That number corresponds to the number of the computer that you will use during the second half of this experiment. Two different prototype programs will be used in the experiment.

If you have a red ribbon you are a "RED TEAM MEMBER." You have a partner called the RED COMPUTER. You and your partner, the RED COMPUUTER, will receive the same evaluation.

If you have a blue ribbon you are a "BLUE INDIVIDUAL." You will also work with a RED COMPUTER <u>BUT</u> you will be evaluated separately from the computer. Please put the ribbon around your right wrist at this time.

Shortly we will go into the computer lab, room 113. As you enter the room you will notice barriers between the computers. The barriers have numbers on them which correspond to the numbers on your wrist band. When you are seated at the correct computer, the barrier with the matching number will be on your right side. All the screens will be blank and a

disk will be in drive A of the computer. Do not turn on the monitors or remove the disk. At this time pick up your Scenario package and pencil and move to the computer lab, room 113.

Move to room and check to ensure that everyone is at the right computer.

Please find your correct computer. When seated at the computer, the barrier will be on your right and the number on the barrier will correspond to the number on your wrist band. The monitor will be blank and a disk will be in drive A of the computer. Do not turn on the monitors or remove the disk until instructed.

After everyone is seated.

At this time, please look at the number on your wrist band and compare it to the number on the barrier to your right. If the numbers do not match please tell me so at this time. Your computer monitor screen should be blank and a disk will be in drive A of the computer. Do not turn on the monitors or remove the disk until instructed.

Near the computer there should be three envelopes labeled 1, 2 and 3. If you do not have these three envelopes please let me know at this time.

Shortly the second portion of the experiment will start. During this portion the following will occur:

1) You will be introduced to the prototype program through a tutorial program.

2) You will interact with the prototype program for 20 minutes. The program is designed to assist you with the space farming problem. It contains information which may help you make better items selections and ranking of those items. In this program either a SPECIALIST or a GENERALIST will assist you in accessing additional information about the items.

3) At the end of 20 minutes you will enter the final portion of the program and make your final selections and rankings of the 11 items that you will take with you to JB-416.

4) Once the final selection has been made, you will be asked to complete the exit questionnaire.

At this time please turn on your monitor. The monitor button is located on the bottom right portion of the monitor. Once you have turned on your monitor please wait for further instructions. If you are unable to locate your monitor button or your monitor does not turn on please tell me so at this time.

Now open the envelop labeled 1. Take out the paper in it and compare your screen to the paper. Your screen should look like the paper except for the bottom row of buttons. If your screen does not look like the paper please tell me so at this time.

This is the tutorial program. The tutorial program will instruct how to: select and item, rank items, change rankings, and use of the SPECIALIST or GENERALIST functions. In this program if a button does not have bold face type in it or does not respond when

clicked, that button is not operational. Please follow the on screen directions. You may now start the tutorial program. You will have 5 minutes.

Time: ________

Your five minutes are up.

Now open the envelope labeled 2 and remove the papers. One paper is screen picture and the other paper is a "Fast Reference Guide" for the program. Do you each have these two pieces of paper?

Please move your mouse up to the word File located at the top left side of your screen. Click on file and then find the work exit and click on exit. This will end the tutorial program. Your screen should now look like the screen picture you withdrew from envelope 2. If your screen does not look like the paper please tell me so at this time.

If you are wearing a red band you are a RED TEAM MEMBER. You and your partner, the RED COMPUTER, will be evaluated together.

If your are wearing a blue band you are a BLUE INDIVIDUAL. You will also use a RED COMPUTER BUT you will be evaluated separately from the RED COMPUTER.

The screen in front of you is the first screen of the prototype program. To complete this screen you will need to enter the unique identification number that you created while in the classroom. You will also need to indicate to the computer if you are a RED TEAM MEMBER or BLUE INDIVIDUAL. In this program you will input your initial item selections and their rankings. Once you have inputted this data PLEASE do not go back and change your initial selections and rankings. You will be given an opportunity to complete another selection and ranking later on. After completing the initial item selection and rankings you will interact with the computer to gain additional information concerning the items. This will be accomplished through the SPECIALIST or the GENERALIST. If you desire, you may use the scenario papers and the pencil to take notes. You will have 20 minutes to interact with the computer at the end of that time you will be asked to make your final selections and rankings. Please follow on screen instructions and refer to the "Fast Reference Guide" as required. You may now start.

Time: ________

Your time is up.

We will now move to the final portion of the program. In this section you will make your final selections and rankings of items that you will take with you to JB-416. Your first choice should be ranked 1 and your last choice should be ranked 11. Please follow the on screen directions. You will have five minutes. Please remain in your seat and do not turn off your computer once you have completed your rankings. Hit the F5 Key to begin.

Time: ________

Your time is up.

Please do not turn off your computer. At this time open envelope 3. In it you will find the Exit Questionnaire. Please fill out and complete the Exit Questionnaire. Once you have complete the questionnaire please remain seated. You will have 5 minutes.

Time: ________

Your time is up. Please remove your wrist band and place it next to the computer. Now place all papers next to the computer. When exiting the room, do not take any papers or experiment materials with you.

Once again thank you for your participation. Please do not discuss this experiment with anyone until after Thanksgiving, 27 Nov. If you have questions concerning this experiment and would like to discuss them with me, a paper with my e-mail address is located at the front of the room. You may e-mail your questions to me at any time, but I will not answer any questions until all the sessions of the experiment has been completed.

Again, thank-you for your cooperation.

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Vita

Captain Shawna R. Wimpy is from Hastings, Nebraska. She graduated from the University of Texas at San Antonio (UTSA) in 1989 with a Bachelor of Arts Degree in American Studies. While attending UTSA she participated in the Reserve Officer Training Corps program. Upon graduation she received her commission into the Air Force. Her first assignment was Sheppard AFB, Texas where she served as a Training Squadron Commander and as a Group Executive Officer. This assignment was followed by a double tour at Osan AB, Korea. At this assignment she served as Section Commander followed by a tour of duty in the 7th Air Force's Protocol office. Upon leaving Korea, Captain Wimpy's assignment was at Munitions Support Squadron at the German Air Force Base, Noervenich Air Base, Germany. Here Captain Wimpy branched out from support positions into the operations arena and served as Emergency Action Officer in the Command Post. She also served as the Chief, Support Office. Upon the closure of Noervenich, Captain Wimpy was accepted into the Information Resource Management Program at the Air Force Institute of Technology, Wright-Patterson AFB, Ohio.

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13. ABSTRACT (*Maximum 200 Words*)

This study investigated the claim that people use social processes relating to other humans when interacting with computers. A laboratory study ($n = 38$) manipulated two team factors, identity and interdependence and a stereotype activation effect to two labels, *generalist* and *specialist*. Subjects for this study were military members or civilians working for the military. The results show that none of the subjects reported being influenced by team or stereotype manipulations as given in self-reports. Incongruent to these findings, the behavioral data demonstrated that subjects were influenced by stereotype labels. There were no interaction effects between team factors and stereotype labels found in either self-reported data or behavioral data.

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AFIT Control Number AFIT/GIR/LAL/97D-15

AFIT RESEARCH ASSESSMENT

The purpose of this questionnaire is to determine the potential for current and future applications of AFIT thesis research. **Please return completed questionnaire** to: AIR FORCE INSTITUTE OF TECHNOLOGY/LAC, 2950 P STREET, WRIGHT-PATTERSON AFB OH 45433-7765. Your response is **important.** Thank you.

1. Did this research contribute to a current research project? a. Yes b. No

2. Do you believe this research topic is significant enough that it would have been researched (or contracted) by your organization or another agency if AFIT had not researched it?
a. Yes b. No

3. **Please estimate** what this research would have cost in terms of manpower and dollars if it had been accomplished under contract or if it had been done in-house.

Man Years__________ $__________

4. Whether or not you were able to establish an equivalent value for this research (in Question 3), what is your estimate of its significance?

a. Highly Significant b. Significant c. Slightly Significant d. Of No Significance

5. Comments (Please feel free to use a separate sheet for more detailed answers and include it with this form):

____
Name and Grade

____
Organization

____
Position or Title

____
Address